Honeywell

MICRO SWITCH
Sensing and Control

June 1997

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Manual Switches

Catalog 30

This information available on CD-ROM and the World Wide Web!

How To Use This Catalog

CATALOG PURPOSE
This catalog is intended to familiarize users with the broad MICRO SWITCH product offering and provide ordering information for the most popular listings.

The products described in the following pages are representative of the thousands of manual switches manufactured and distributed worldwide by Honeywell MICRO SWITCH Division. Almost all of the catalog listings given are preferred listings and normally will be off-the-shelf-delivery.

USING THE CATALOG
This section on "How To Use The Catalog" will help you make a logical choice in selecting the best product for a particular application need. It allows a user, familiar with our products, to quickly locate the exact page the needed product catalog listings are on. For those unfamiliar with MICRO SWITCH products, a logical sequence is given to help the user pick the appropriate product for their application need.

By taking a few minutes to familiarize yourself with the catalog organization you will find it very easy to locate the product you need.

REFERENCE DATA
For help in designing the interface between your products and the people who use them, see the Panel Design Guide pages 150-154.

SOLDERING
For information on soldering to switch terminals request "Data Sheet 200" from any sales and service location identified on the back cover.

MOUNTING DIMENSIONS
Mounting dimensions are shown at the end of each product section in English and metric equivalents. These dimensions are for reference only. For exacting layout work, request an engineering drawing from the 800 number.

Many of the most popular manual switches are included in this catalog. Many others, developed for special needs, are not. For more information or prices, contact the 800 number.

SELECTION
On page 1 you can see representative products found in the catalog. The various switch types and offerings are highlighted below.

1. **1TL1-2**
   If you have a catalog listing, use the alpha-numeric index/page number starting on page 162.

2. **TL TOGGLE SWITCHES**
   If you know the type of switch you're looking for, use the Index by Product Type on page 3 to find the page number.

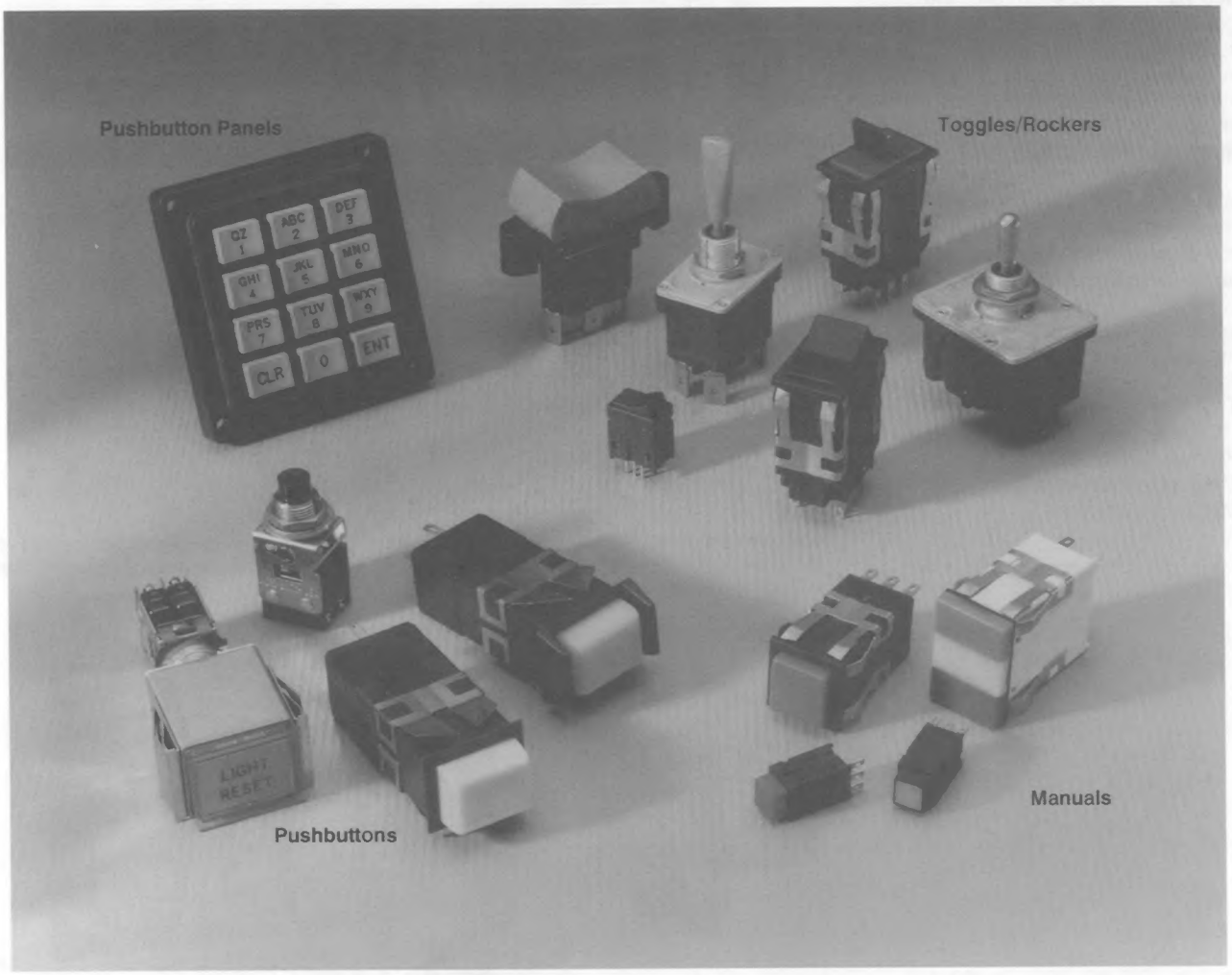
3. **USE SELECTION GUIDE**
   If you're not familiar with the product or need more information, a detailed selection guide begins on page 4. Here photos for each product type and important selection factors are given to help determine and select the best product for the application. They include:

- Physical description—size, actuation, mounting, etc.
- Display, illumination
- Electrical parameters—ratings, supply, output, etc.
- Environment/sealing
- Agency listings
- Special features

In many cases more than one product may work. For the most cost-effective solution, compare prices and consider alternatives. Remember, end cost includes initial product price, plus installation, plus service.

Application note: Enclosures are based, in general, on the broad definitions outlined in NEMA Standards. Therefore, it will be necessary to ascertain that a particular enclosure will be adequate when exposed to the specific conditions that might exist in intended applications. Except as might otherwise be noted, all references to products relative to NEMA enclosure types are based on MICRO SWITCH evaluation only.

Manual Switches



Pushbutton panels. Low profile SLP pushbutton panels feature standard matrices. They use a conductive rubber technology for operator feedback, plus legends and a variety of button sizes and colors.

Manual switches. Designed by industrial designers to achieve a balance between harmonious appearance and ergonomics, AML Advanced Manual Line has pushbuttons, paddles,and rockers; with LED, incandescent, and neon illumination. Plus matching indicators and LED annunciators. A smaller cousin, MML Miniature Manual Line, offers many AML features in a space-saving size.

Pushbuttons. A wide array of different pushbutton families, many with lighted display and matching indicators. Includes Series 2, an easily assembled modular design with many color display/control options; and compact PB unlighted pushbuttons.

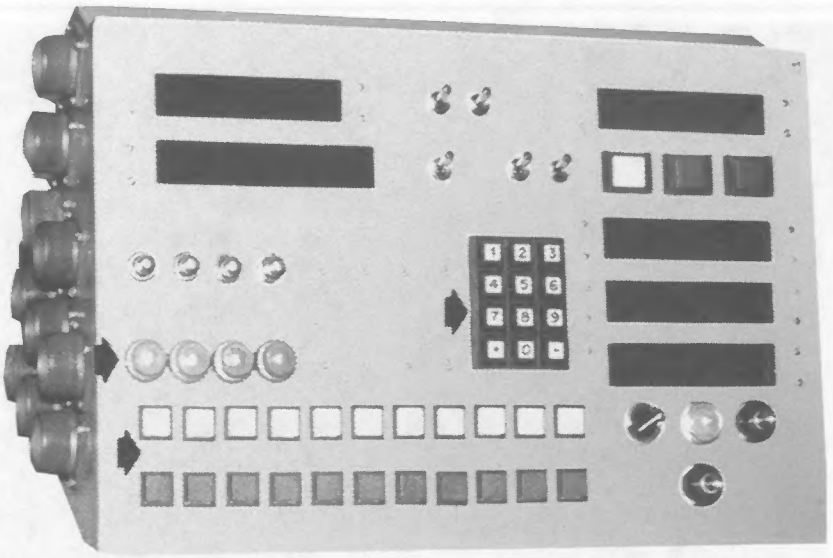
Toggles/Rockers. NT/TL, TS, TW and AT toggles, and NR/TP rockers feature various degrees of sealing, choice of many circuitry combinations, and 2 or 3-position operation.

Manual Switches
Typical Applications

When you need pushbuttons, indicators, toggles, rockers, paddles, rotary selectors, and door devices, we have the solution to meet your needs. In addition to commercial grade products, you can also choose from manual controls that meet military specifications.

The MICRO SWITCH product lines offer versatility and flexibility, giving you a multitude of design and electrical options for a variety of applications.

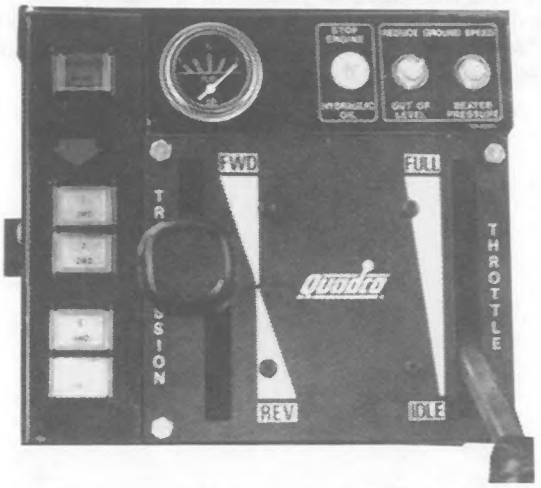
Typical Applications
- Industrial Equipment
- Radar Equipment
- Test Instruments
- Computer Mainframe and Peripherals
- Process Control
- Medical Instrumentation
- Military Equipment



The sawyers control console featuring AML lighted pushbuttons (bottom rows, center), eight BZ-2RQ1T, plungers visible above AML's, top four with dust covers removed, and a PX numeric keyboard (center).

AML lighted pushbuttons and rockers from MICRO SWITCH are used on the Z-MAC "master panel" to activate operation and provide visual feedback for the user. AML's coordinated appearance was just one of the reasons for chosing AML.

Foster Airdata's LNS6 16 is only three inches wide, yet fully integrates 3 popular navigational technologies. Four miniature MICRO SWITCH MML lighted pushbuttons (center) update the navigational information during a flight.



These Series 2 pushbuttons control "stop," "start," "header," and "viner" functions on a separate control panel of a pea and bean harvester.

Manual Switches

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Manual Switches

Pushbutton Panels and Manual Switches Selection Guide

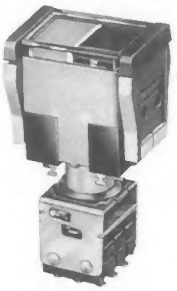
	SLP Pg. 8	AML Pg. 16			MML Pg. 66		
PHYSICAL DESCRIPTION Panel Area	Depends on size of matrix.	.80″ (20,5 mm) square and .80″ × 1.20″ (20,5 × 30,5 MM).			PWB mount: .40″ (10,2 mm) square and .60″ × .40″ (15,2 × 10,2 mm), except 2-pole power duty paddles and rockers.		
Display	Standard panels: .62 × .48″ (15,7 × 12,2 mm) buttons.	.59″ (15,0 mm) square and .59 × .99″ (15,0 × 25,0 mm) buttons. Pushbutton or lens cap (indicator only) buttons with up to 3-section display. Various button heights. Transmitted, projected, and dead front hidden legend/color.			Pushbuttons: .26″ (6,6 mm) square and .46″ × .26″ (11,7 × 6,6 mm). Transmitted color. Rockers: Optional lenses for transmitted color.		
Illumination	—	Incandescent T-1-3/4 lamps — 6, 14, 28 v. LED's — 2, 4, 5, 10, 15 v. Neon lamps — 125, 250 v.			LED's — 1.7, 2.1, 2.2, 2.3 V Incandescent T-1 lamps — 5 V (other voltage available)		
Behind Panel Depth (max.)	.26″ (9,1 mm), less connector.	1.7″ (43,1 mm)			.67″ (17,0 mm)		
Mounting	Front or rear panel mount.	Snap-in individual, strip, matrix, sub-panel, P.C. board mounting.			Printed wiring board, snap-in strip, matrix.		
Termination	Connector.	Solder, quick-connect, P.C. board, push-on.			Printed wiring board, solder, quick-connect		
Sealing	—	Optional panel seal.			—		
SPECIAL FEATURES	—	Along with companion rockers and paddles, provides the most advanced and complete line of manual controls available.			—		
CHARACTERISTICS Electrical Data	30 mA @ 12 VDC, .500 sec. contact duration.	Solid State: 5, 6-16, or 4.5-24 VDC.	Electronic Control: Up to 3a., 125 VAC.	Power Duty: Up to 10a., 125/250 VAC.	Solid State: 5-24 VDC	Electronic Control: Up to 1 a., 125 VAC res.	Power Duty Push-buttons: Up to 6 a., 250 VAC res.
Circuitry	X-Y or common bus	Current Sinking	1, 2 & 4 Form C	2 pole, Form X	Current Sinking	1 or 2 Form C	1 or 2 Form X
AGENCY LISTINGS	N/A	UL, CSA, VDE and CE (selected products)*			UL and CSA		

* For complete international compliance information, contact the 800 number.

AML27 KEYLOCK SWITCHES

Enable control of access to computer peripherals, keyboards, point-of-sale terminals, and security systems which are locked when unattended; and other locations where tampering must be discouraged. See page 34.

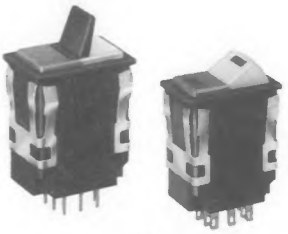
Manual Switches

	 Series 4 **Pg. 99**	 **Series 2** **Pg. 105**
PHYSICAL DESCRIPTION Panel Area	.84 × 1.03″ (21,3 × 26,2 mm).	1.0 × 1.41″ (25,4 × 35,8 mm). .86 × 1.35″ (21,8 × 34,3 mm).
Display	.53 × .71″ (13,5 × 18,0 mm) buttons. Single section display. Transmitted, projected, and dead front hidden color.	.85 × 1.08″ (21,6 × 27,4 mm). buttons. 1-4 section display. Transmitted and projected color.
Illumination	Incandescent T-3-1/4 lamps — 14, 28v.	Incandescent T-1-3/4 lamps — 28v.
Behind Panel Depth (max.)	2.40″ (6,1 mm)	3.28″ (83,3 mm)
Mounting	Snap-in individual or strip mounting; top panel or sub-panel mounting.	Snap-in flange mount and units with mounting barriers for individual or strip mount.
Termination	Solder, quick-connect, P.C. board	Solder, quick-connect, and screw terminals.
Sealing	—	—
SPECIAL FEATURES	Can be furnished with locked button feature for use in public areas where tampering is a problem.	—
CHARACTERISTICS Electrical Data Circuitry	 Up to 10 a. 1 or 2 Form C	 1-20 a., 125, 250, 480 VAC, depending on switch module specified. 1-4 Form C.
AGENCY LISTINGS	UL, CSA	UL, CSA

Selection

Manual Switches

Unlighted Pushbuttons, Toggles/Rockers Selection Guide

	 PB **Pg. 116**	 **AML** **Pg. 16**		
PHYSICAL DESCRIPTION Panel Area	Depends on type and number of basic switches.	.80 × 1.20" (20,5 × 30,5 mm).		
Display	.32" (8,1 mm) dia., and other button sizes. Colored buttons.	Paddle: Full and split color covers.	Rocker: Full and split color rockers.	
Mounting	Threaded bushing.	Snap-in individual, strip, matrix, subpanel, P.C. board mounting.		
Termination	Solder terminals.	Solder, quick-connect P.C. board, push-on.		
Sealing	Panel seal version. Hermetically sealed switch units.	—		
SPECIAL FEATURES	Compact size.	Matches display/control options of AML pushbuttons.		
CHARACTERISTICS Electrical Data	2-5 a., 125/250 VAC.	Solid State: 5, 6-16, or 4.5-24 VDC	Electronic Control: Up to 3a., 125 VAC.	Power Duty: Up to 15a., 125/250 VAC.
Circuitry	1-4 Form C.	Current sinking	1, 2 & 4 Form C.	1 and 2 Form A.
		2 or 3 positions, mom. or maint. action.		2 pos. maint.
AGENCY LISTINGS	UL, CSA. Some meet MIL-S-8805 and MIL-STD-1080D.	UL, CSA, VDE and CE (selected products)*		

* For complete international compliance information, contact the 800 number.

Manual Switches

Toggles/Rockers Selection Guide

	TS Pg. 135	NT/TL Pg. 120/126/135	NR/TP Pg. 123/126/141	AT Pg. 145
PHYSICAL DESCRIPTION Panel Area	2-pole: 1.31 × .75″ (33,3 × 19,0 mm).	2-pole: 1.32 × .89″ (33,5 × 22,6 mm).	2-pole: 2.13 × .89″ (54,1 × 22,6 mm).	Depends on type and number of basic switches.
Display	Toggle lever. Colored lever sleeves.	Toggle lever. Colored lever sleeves.	Full color and transparant rockers.	Toggle lever operator. Colored lever sleeves.
Behind Panel Depth (max.)	1.08″ (27,4 mm).	1.35″ (34,3 mm)	1.45″ (36,8 mm).	.63 to 2.01″ (16,0 to 51,1 mm), depending on switch type.
Mounting	Threaded bushing.	Threaded bushing.	3-hole flush or above panel mounting.	Threaded bushing.
Termination	Solder, screw, or quick connect.	Screw, solder, Q-C. IWTS (TL only).	Screw, solder. Q-C (NR only).	Solder, screw, or quick connect.
Sealing	Bushing seal.	Bushing and cover-to-case seals.		Bushing and panel seals, hermetically sealed switch units.
SPECIAL FEATURES	—	Pull-to-unlock toggle option.	—	Pull to unlock and tab lever options.
CHARACTERISTICS Electrical Data	Up to 15a., 125 or 250 VAC.	Up to 15a., 125 or 250 VAC. (TL switches also covered by MIL-S3950 28/115/250 VDC, and 115/230 VAC ratings.)		Up to 15a., 125 or 250 VAC.
Circuitry	1 or 2-pole, 2 or 3 positions, mom., and maint. action.	1, 2 or 4-pole, 2 or 3 positions, mom. and maint. action.		1-10 poles, 2 or 3 positions, mom. and maint. action.
AGENCY LISTINGS	UL, CSA.	UL, CSA. MIL-S-3950 (TL only)	UL, CSA.	UL, CSA. Some meet MIL-S-8805/26 and MIL-S-8805/98.

TW Miniature Toggle Switches

- Colored tab levers (shown), standard and pull-to-unlock levers
- Solder or IWTS termination
- SPDT or DPDT circuitry
- 1/4″ or 15/32″ bushings
- MIL-S-83731 qualified versions

Refer to pg. 130.

Manual Switches
Low-Profile Pushbutton Panels

SLP1 Series

FEATURES/BENEFITS

- Designed and manufactured to meet the specific needs of your application – including these feature options:
  - Custom layout.
  - Wide selection of button sizes and colors – capable of replacement from the panel front.
  - Legend service on buttons.
  - Can be furnished wired-only or with built-in interface electronics.
  - Provision for including lighted message displays.
  - Termination direct to PC board.
  - Custom enclosures available.
- Tactile feedback of switching action.
- Low-cost installation – complete assembly is furnished ready to attach with mounting screws. Mass termination to plug-in connector saves wiring time.
- Low energy contacts – compatible with microprocessors and other low level logic circuitry.
- Advanced construction and manufacturing processes reflect the MICRO SWITCH commitment to high quality, reliability, and performance.

These low-profile pushbutton panels combine the latest advancements in conductive rubber switching technology and pushbuttons in a custom package, tailored to your requirements. They meet the needs for reliable manual switching in applications that do not normally require high speed thruput.

Featuring .100 inch (2,4 mm) high buttons and a .505 inch (12,8 mm) panel frame depth, their low profile easily adapts to your system's styling and package size requirements. Your design can include a provision for digital readouts, CRTs, LCDs and other solid state lighted message displays, encoders, microprocessors, etc. – which can be either assembled by you or MICRO SWITCH.

TYPICAL APPLICATIONS

- Marine Control Panels
- Instrumentation
- Banking Machines
- Office Copiers
- Test Equipment
- Vending Machines
- Medical Monitoring and Diagnostic Devices
- Telecommunications Equipment
- Hand-Held Controllers
- Programmable Controllers
- Security Entrance Control
- Industrial Controls

SPECIFICATIONS

Environmental	
Operating Temperature	–40°C to 65°C (–40° to 149°F)
Storage Temperature	–40°C to 70°C (–40° to 158°F)
Altitude	–100 to 50,000 ft.
Vibration	MIL-STD-202F, Method 204, Condition A – frequency to 500 cycles: .06 in. double amplitude or 10 G's and a frequency range of 10 to 500 cycles.
Shock	MIL-STD-202F, Method 213B, Condition A – 50 G's, 1/2 sine, 11 millisecond pulse.
Sulphur Atmosphere	Withstands a sulphur atmosphere at 80% RH. 60°C (140°F) for 10 days
Steady State Humidity	MIL-STD-202F, Method 103B, Condition B – 90-95% RH at 40°C for 96 hours. Insulation resistance will not be less than 10 megohmns min.
Mechanical	
Travel (nominal)	1,3 mm (.05 in.)
Operating Force (typical)	125 grams (4.4 oz. approx.)
Operating Life	10 x 10^6 operations, 95% survival.
Force deflection (nominal)	Peak force, 125 grams (4.4 oz. approx.); Drop-off force, 60 grams (2.1 oz. approx.) (See force deflection curve chart.)
Electrical	
Contact Rating	30 mA @ 12 VDC, .500 sec. contact duration
Closed Circuit Resistance	500 ohms max. over life.
Open Circuit Resistance	10 megohmns min.
Contact Disturbance Time	10 millisec. max. at 2 lbs. (8,9 Newtons) full overtravel force, when mechanically actuated at 4 in. (10,6 mm) sec. plunger velocity.
Capacitance	Less than 20 picofarads per station.
Circuitry	X-Y or common bus.

Manual Switches

Low-Profile Pushbutton Panels

SLP1 ORDER GUIDE (All possible combinations may not be available.)

SLP1	3	0	A	12	—	27
SLP Series	**Circuitry**	**Unlighted**	**Legend**	**Matrix**		**Button Color**[1]
SLP1	2-XY 3-Common Bus	0 Unlighted	**A**-No Legend **B**-Legended Black ink[2] **C**-Legended White ink[2] **D**-Legended Black and White ink[2]	**4**-1×4 **12**-3×4 **16**-4×4 **20**-4×5		**-10** Gray **-11** White **-12** Red **-13** Yellow **-14** Green **-16** Blue **-18** Black

[1] Factory will assign non-standard button colors and combinations. Complete SLP Custom Order Sheet.
[2] SLP Custom Order Sheet must accompany order.

Example:
SLP130A12-14 Common bus circuitry, no legend, 3×4 with green buttons.

INDIVIDUAL BUTTON CATALOGING

SLP51	A	20	—	G
Button Style	**Open Field**	**Legending**		**Color**
SLP51-Unlighted	A	**10**-No legend **20**-Legended Black ink[1] **21**-Legended White ink[2]		**–R** Red **–G** Green **–Y** Yellow **–B** Blue **–W**White **–K** Black **–A** Gray

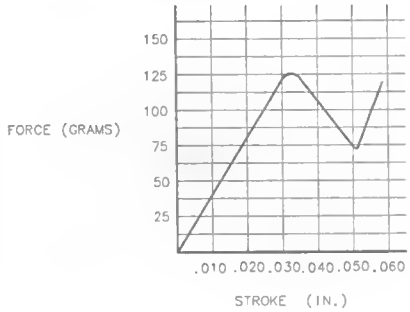
[1] SLP Custom Order Sheet must accompany order.

Example: **SLP51A20-G**
Green button legended with black ink.

TERMINATION

A header type connector provides termination directly from the printed circuit board. Products shown here have straight exit headers (see mounting dimension drawings). Right angle exit header connectors can also be furnished. Connector pins are .025 inch (0,64mm) square, on .100 inch (2,54 mm) centers, by .318 inch long. Suitable for use with vast array connector manufacturers' standard products.

Force Deflection Curve

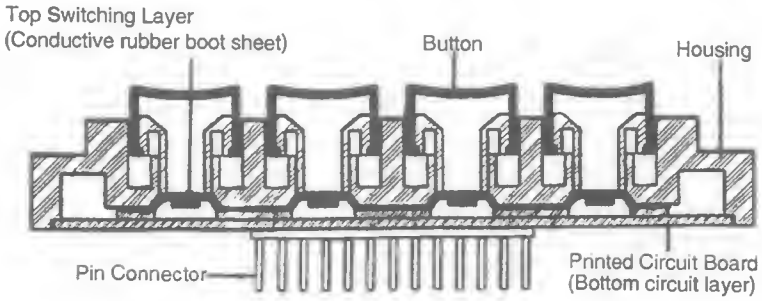


CONSTRUCTION

The top switching layer is a conductive rubber boot sheet (see cutaway drawing). When force is applied to a button, contact is made between the boot and the bottom circuit layer on a printed circuit board. The boots impart an excellent tactile feedback (see force deflection curve chart).

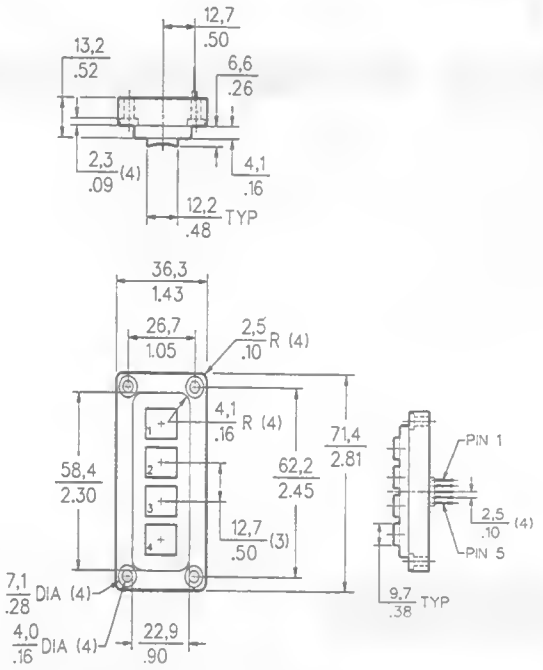
A molded plastic housing, with panel slots for buttons and mounting holes in each corner, is placed over all components and ultrasonically welded to the printed circuit board. Interface circuitry can be easily added to the PCB by the user or furnished built-in.

CUTAWAY VIEW



Manual Switches
Low-Profile Pushbutton Panels

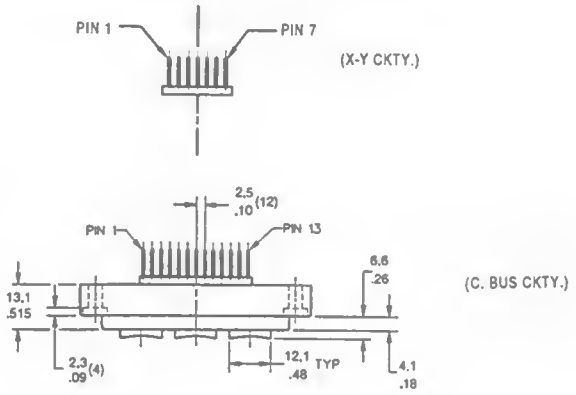
1 X 4 PANEL



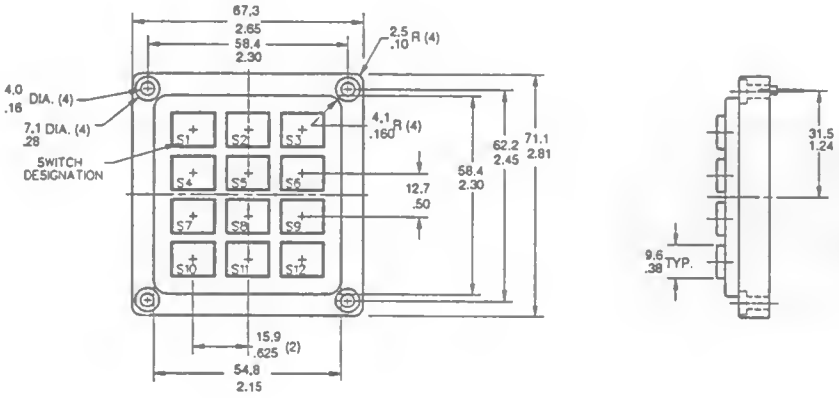
Station No.	Switch Pins
1	1-5
2	2-5
3	3-5
4	4-5

Note: Connector pins are .418 in./10,6 mm long.

3 X 4 PANEL



Station Nos.	With X-Y Cktry. Switch Pins:	With C. Bus Ckty. Switch Pins:
1	4-5	4-13
2	4-6	8-13
3	4-7	12-13
4	3-5	3-13
5	3-6	7-13
6	3-7	11-13
7	2-5	2-13
8	2-6	6-13
9	2-7	10-13
10	1-5	1-13
11	1-6	5-13
12	1-7	9-13

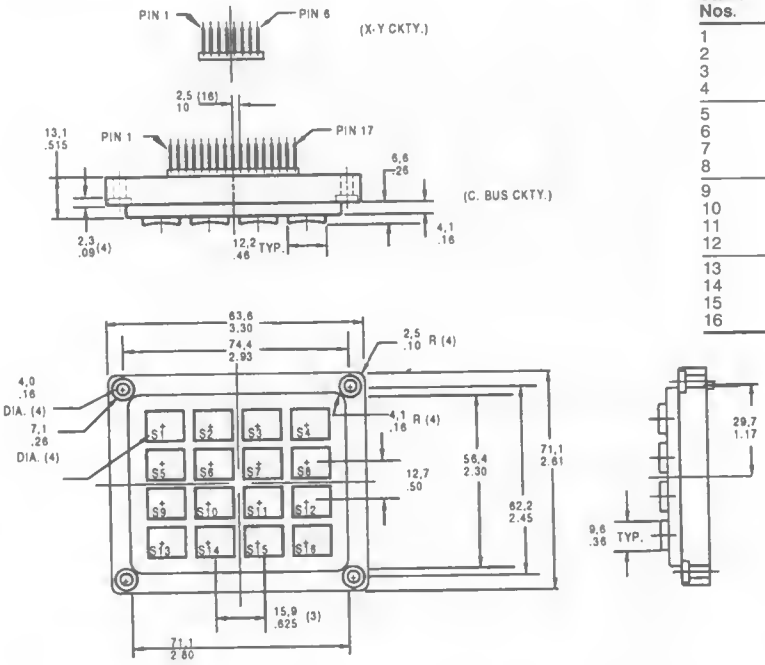


Note: Connector pins are .418 in./10,6 mm long.

Manual Switches

Low-Profile Pushbutton Panels

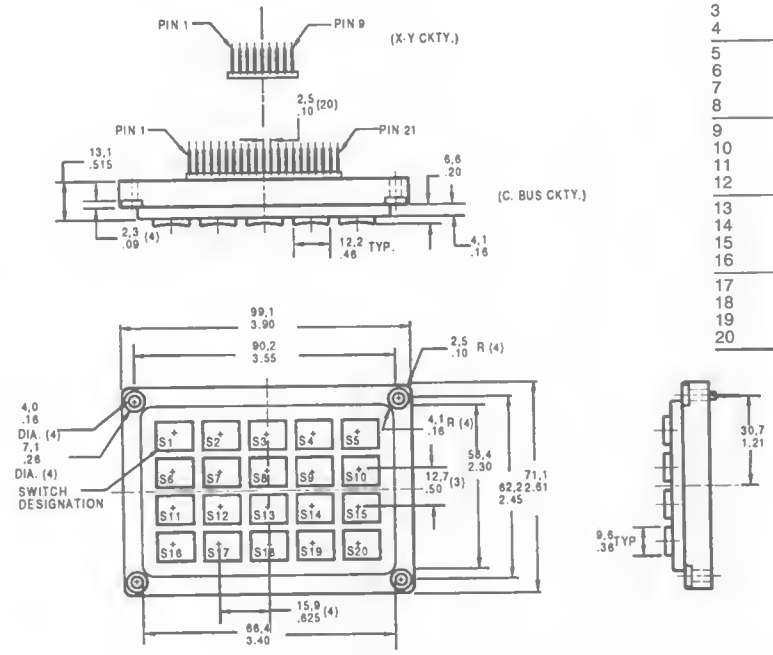
4 x 4 PANEL



Station Nos.	With X-Y Cktry. Switch Pins:	With C. Bus Cktry. Switch Pins:
1	3-2	4-17
2	3-6	8-17
3	3-7	12-17
4	3-8	16-17
5	5-2	3-17
6	5-6	7-17
7	5-7	11-17
8	5-8	15-17
9	4-2	2-17
10	4-6	6-17
11	4-7	10-17
12	4-8	14-17
13	1-2	1-17
14	1-6	5-17
15	1-7	9-17
16	1-8	13-17

Note: Connector pins are .418 in./10,6 mm long.

5 X 4 PANEL



Station Nos.	With X-Y Cktry. Switch Pins:	With C. Bus Cktry. Switch Pins:
1	4-5	4-21
2	4-6	8-21
3	4-7	12-21
4	4-8	16-21
5	4-9	20-21
6	3-5	3-21
7	3-6	7-21
8	3-7	11-21
9	3-8	15-21
10	3-9	19-21
11	2-5	2-21
12	2-6	6-21
13	2-7	10-21
14	2-8	14-21
15	2-9	18-21
16	1-5	1-21
17	1-6	5-21
18	1-7	9-21
19	1-8	13-21
20	1-9	17-21

Note: Connector pins are .418 in./10,6 mm long.

Honeywell

SLP Custom Order Sheet

Instructions

1. Fill in desired legends for the appropriate button layout. (Leave blank any buttons which are not to be legended.)

   To determine if a given legend will fit, add the decimals shown for each letter (or number) under the desired type size in the Legending Capacity Table. In all cases, the total must not exceed .450.

   EXAMPLE: The legend **START** specified in 7/64 type size consists of: **S**(.086) + **T**(.087) + **A**(.086) + **R**(.095) + **T**(.087), for a total of **.441**. Since the total does not exceed .450, this legend will fit.

   The 5/64 type size can be used for one-line or two-line legends. All other type sizes are used for one-line legends only. Legends will be centered on buttons.

2. Fill in the desired button colors, legend sizes and legend colors (unless button is to be unlegended). See button layouts for station reference numbers. Use only the number of lines for the appropriate button layout.

   EXAMPLE: A 1 x 4 would have station no. lines 1-4 filled out.

   Standard button colors are red, green, yellow, white, gray, and blue.

   Standard legend colors are black and white.

3. Submit a separate legend sheet for each SLP catalog listing.

Catalog Listing **SLP**		
Customer P.O. No.		Customer Dwg. No.
MICRO SWITCH Sales Order	Line Number	Schedule No.

Customer: _____

Address: _____

_____ (city) (state)

Sheet prepared by: _____

Phone No.: _____

Legends are applied by the pad printing process. Shown at right are examples of the standard typeface.

5/64
A - Z 0 - 9
7/64
A - Z 0 - 9
9/64
A - Z 0 - 9
13/64
A - Z 0 - 9

Legending Capacity Table

Legend	5/64	7/64	9/64	13/64	Legend	5/64	7/64	9/64	13/64
A	.070	.086	.097	0.152	S	.069	.086	.097	0.153
B	.079	.096	.108	0.162	T	.069	.087	.097	0.142
C	.080	.096	.108	0.162	U	.084	.106	0.123	0.179
D	.080	.105	0.122	0.171	V	.070	.087	.098	0.147
E	.070	.086	.097	0.153	W	.102	0.121	0.143	0.211
F	.069	.081	.096	0.142	X	.069	.085	.097	0.147
G	.079	.095	.105	0.171	Y	.069	.086	.097	0.145
H	.079	.106	0.122	.180	Z	.069	.081	.086	0.142
I	.034	.042	.054	.072	1	.069	.087	.098	0.142
J	.060	.072	.087	0.119	2	.070	.087	.095	0.142
K	.079	.095	.109	0.161	3	.068	.086	.095	0.142
L	.070	.081	.097	0.142	4	.070	.086	.097	0.142
M	.100	0.121	0.143	0.210	5	.070	.087	.097	0.141
N	.081	.106	0.123	0.181	6	.070	.087	.097	0.143
O	.080	.106	0.122	0.171	7	.070	.087	.097	0.141
P	.070	.087	.107	0.150	8	.070	.087	.097	0.142
Q	.080	.107	0.122	0.171	9	.070	.087	.097	0.142
R	.079	.095	.106	0.161	0	.070	.087	.096	0.142

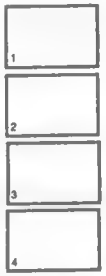
FO-64419-B

Honeywell

SLP Legend Order Sheet

1 x 4 Button Layout

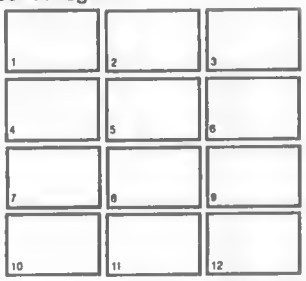
1. Fill in desired legends.



Stations numbered for reference only.

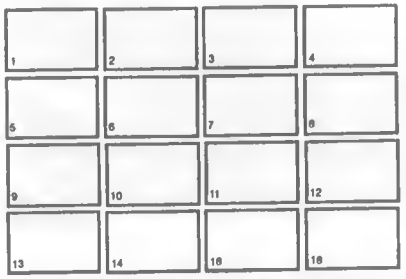
3 x 4 Button Layout

1. Fill in desired legends.



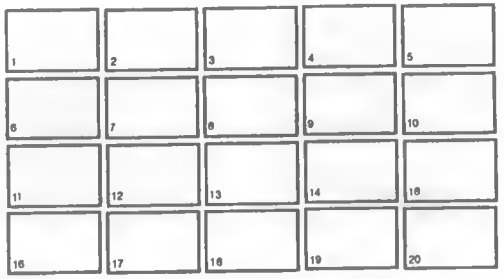
Stations numbered for reference only.

4 x 4 Button Layout



Stations numbered for reference only.

5 x 4 Button Layout



Stations numbered for reference only.

2. Fill in desired legends, button colors, legend colors, and legend size.

Station No.	Button Color	Legend Color	Legend Size
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

F0-64419-8 - Pg2

Honeywell

SLP 51 Button Legending Order Guide

INSTRUCTIONS:

1. Fill in desired legends on the order chart below. To determine if a given legend will fit, add the decimals shown for each letter (or number) under the desired type size in the Ledging Capacity Table. In all cases, the total must not exceed .450 for Fig. 2 or .350 for Fig 1.

   Example: The legend **START** specified in 7/64 type size consists of: S(.086) + T(.087) + A(.086) + R(.095) + T(.087), for a totoal of .441. Since the total does not exceed .450, this legend will fit.
2. Fill in the catalog listing - one listing per sheet.
3. Check proper Fig. #, Type Size and Type Color.
4. Fill in quantity required for each legend.

NOTES:

1. Legends will be centered within button.
2. Legends will be pad printed and oversprayed with a protective, clear material.

Button Type	Figure	Maximum Lines/Area				
		5/64	7/64	9/64	13/64	
A	1	3	2	2	1	
A	2	2	1	1	1	

SPECIAL LEGENDS

NOTE: Use this area to show special Legend Locations or Configurations NOT shown to the left. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A"	Fig. "B"

LEGEND ORDER CHART

Customer Part #	Fig #	Type Size				Legend Color		Button Qty.	Legend Description		
		5/64	7/64	9/64	13/64	BLK	WHT		1st Line	2nd Line	3rd Line

FO-84479-A

Catalog Listing SLP51__ -		
Customer P.O. No.	Customer Dwg. No.	
MICRO SWITCH S.O. Number	Line Number	Schedule No.

Customer: _____

Address: _____

_____ (city) (state)

Sheet prepared by: _____

Phone Number: _____

LEGENDING CAPACITY TABLE

LEGEND	5/64	7/64	9/64	13/64	LEGEND	5/64	7/64	9/64	13/64
A	.070	.086	.097	.152	1	.069	.087	.098	.142
B	.079	.096	.108	.162	2	.070	.087	.095	.142
C	.080	.096	.108	.162	3	.068	.086	.095	.142
D	.080	.105	.122	.171	4	.070	.086	.097	.142
E	.070	.086	.097	.153	5	.070	.087	.097	.141
F	.089	.081	.096	.142	6	.070	.087	.097	.143
G	.079	.095	.105	.171	7	.070	.087	.097	.141
H	.079	.106	.122	.180	8	.070	.087	.097	.142
I	.034	.042	.054	.072	9	.070	.087	.097	.142
J	.080	.072	.087	.119	0	.070	.087	.096	.142
K	.079	.095	.109	.181	$	.069	.086	.097	.145
L	.070	.081	.097	.142	¢	.069	.091	.107	.142
M	.100	.121	.143	.210	#	.080	.105	.122	.171
N	.081	.108	.123	.181	%	.084	.137	.164	.233
O	.080	.106	.122	.171	+	.064	.110	.120	.180
P	.070	.087	.107	.150	-	.035	.106	.117	.183
Q	.080	.107	.122	.171	±	.064	.139	.168	.250
R	.079	.095	.108	.181	÷	.079	.139	.166	.250
S	.069	.086	.097	.153	=	.084	.126	.140	.207
T	.089	.087	.097	.142	≠	.084	.139	.166	.250
U	.084	.108	.123	.179	>	.112	.139	.156	.251
V	.070	.087	.098	.147	<	.112	.139	.156	.251
W	.102	.121	.143	.211	X	.069	.140	.166	.250
X	.069	.085	.097	.147	)	.050	.062	.073	.097
Y	.089	.088	.097	.145	(	.050	.062	.073	.097
Z	.069	.081	.086	.142	&	.081	.097	.108	.170
					*	.054	.089	.102	.123
					.	.035	.042	.052	.072

Manual Switches

Hall Effect Keyboards/Modules

SD HALL EFFECT KEYBOARDS

MICRO SWITCH SD Series Hall effect keyboards meet high performance, custom design, full-travel keyboard needs. They're unsurpassed for switch speed, reliability and accuracy. Modular construction allows flexibility in keyboard layout and size.

Hall effect keyboards are offered in standard profile and low profile, sealed or unsealed, in standard arrays, and in custom arrays tailored to fit the user's specific application. Hall effect keyboards are capable of handling very high throughput applications.

A sealed version of the Hall effect keyboard (101SD29-2E-S-H) designed for harsh duty industrial environments meets NEMA 4 and 13 water/moisture resistance standards.

Request Product Sheets:
26SD – 84-02506
32SD – 84-02502
63SD – 84-02504
101SD – 84-02501
12/16SD – 84-02607
101SN – 84-02508
1001SD – 84-02505

SN/SD HALL EFFECT KEYSWITCH MODULES

SN and SD Series keyswitch modules are ideal for building custom arrays, such as keyboards, control/switch panels, and switch matrices. Lighted display options are available.

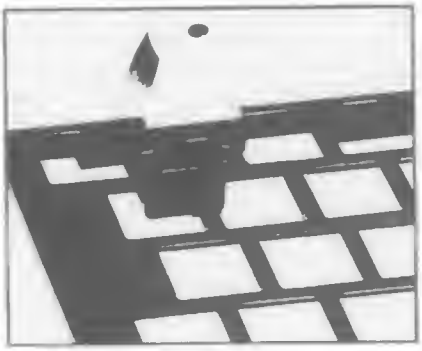
SN modules are available in types that can be either snap-in panel mounted or mounted directly to printed circuit boards without additional mounting or support hardware. Request Product Sheet 84-02508.

SD modules have a lower profile than SN. They securely mount in a metal grid plate which provides support and enhances good keytop alignment between stations and rows. Request Product Sheet 84-02505.

SN PC Board Mount

SN Snap-in Panel Mount

SD Grid Plate Mount



For further information on Hall effect keyboards, keytops, and modules, contact your nearest MICRO SWITCH sales office. Or call 1-800-537-6945.

Manual Switches
Advanced Manual Line

Solid state switches — AML10 series

AML11/12 pushbutton switches 20/21
AML13/15 paddle switches 22/23
AML14/16 rocker switches 24/25

Electronic control switches — AML20 series

AML21/22 pushbutton switches 26/27
AML23/25 paddle switches 28/29
AML24/26 rocker switches 30/31
AML27 keylock switches 32

Power duty switches — AML30 series

AML31/32 pushbutton switches 33
AML33/35 paddle switches 34
AML34/36 rocker switches 35

Indicators, Annunciators — AML40 series

AML41/42 indicators 36
AML45 annunciators 37

Buttons, rockers, covers, cap assemblies — AML50 series

AML59 annunciator cap assemblies 40
AML51/52 pushbutton switch and indicator buttons 42/43
AML53/55 paddle switch covers 47/48
AML54/56 rocker switch operators 51/52

Mounting hardware — AML60 series

AML61 mounting bracket assembly 55

Accessories — AML70 series

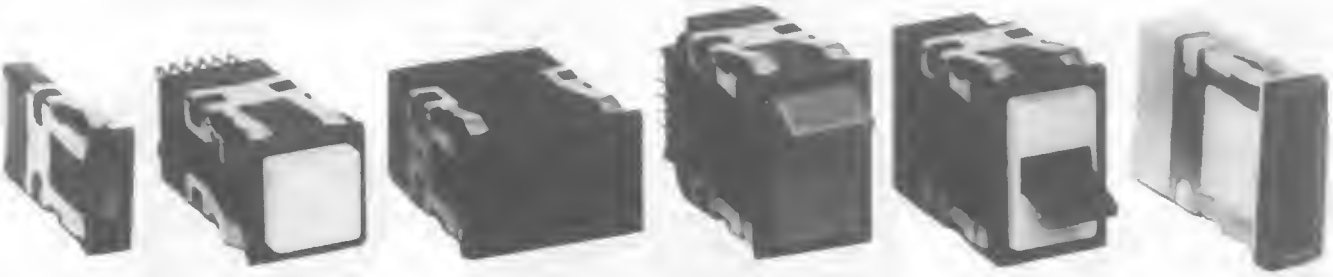
AML71 barriers and AML75 panel seals 56
AML76 switch guards and AML78 panel plugs, dummy housing 57
AML79 connector block 57

Lamps and LEDs — AML90 series

AML91 incandescent wedge base T-1¾ lamps and AML92 T-1¾ LEDs 58

Mounting dimensions 59

Manual Switches
Advanced Manual Line



IN FRONT OF THE PANEL

Coordinated, attractive appearance. AML features innovations designed by industrial designers to achieve the best balance of human factors and aesthetic appearance. Operator height, bezel size, and the compatibility of square and rectangular shapes blend with other components to harmonize your panel. There's no visual clutter to distract from man/machine communication.

This comprehensive line of lighted and unlighted manual controls features:
- Pushbuttons for high and intermediate frequency functions;
- Rocker and paddle switches, with 2 or 3 positions, for less frequent control functions;
- Plus lighted indicators and annunciators which complement AML's universal appeal.

Various controls can be matched with their functions to accommodate the most natural and efficient habit pattern reflex. Keylock operated switches can be used to assure "authorized personnel only" access.

Display flexibility. AML offers a choice of five legend sizes, four button heights, full or split section display, and illumination by incandescent lamps, LED's or neons. Colors are bright and uniform, providing a strong definition and good visibility. (Non-illuminated devices have the same attractive colors.)

Color display options include:
- Transmitted color — color can be distinguished whether lamp is On or Off.
- Dead front — display appears black, until illumination causes legend and color to appear.
- Projected color — white display is diffused with color when illuminated.

BEHIND THE PANEL

AML's simple, cost effective design provides many behind-panel benefits for the designer and installer/user.

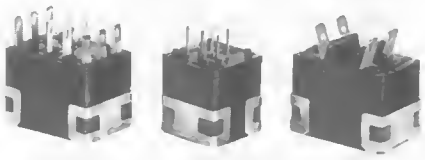
Simple to install. They snap in from the panel front individually or in vertical or horizontal strips; or in subpanel mounted strips and matrices that can be pre-assembled and pre-wired to assure accurate alignment and efficient panel building.

Electrical flexibility. Solid state switches with Hall effect integrated circuits interface directly with microprocessors and other logic level devices. These IC's were first applied in MICRO SWITCH solid state keyboards. Today, many MICRO SWITCH products incorporate the Hall effect technology to meet a wide range of position sensing and manual control needs.

Electronic control switches with gold or silver contacts, and 1, 2, or 4 poles, will handle up to 3 amps. Including an encoded version which generates different binary coded outputs merely by changing cam-keyed buttons.

Power duty switches meet line disconnect application needs with 10-amp pushbuttons and 15-amp paddle and rocker switches.

Easy to wire. All AML devices present single level termination. This means faster, easier, neater, and more economical wiring. And there is a choice of solder, quick-connect, push-on, and printed circuit termination.



MATING RECEPTACLES

The .110 × .020 quick-connect/solder terminal (types 2 and 8) is designed for use with receptacles that comply with the UL standard for insertion and withdrawal forces. Maximum insertion force is 12 lbs. max., withdrawal force is 14 lbs. These receptacles are supplied by: AMP Inc., Berg, Augat, Hollingsworth, MALCO, Zierick, and others. Refer to Thomas Register or the Yellow Pages for the location of your local supplier.

Manual Switches
Advanced Manual Line

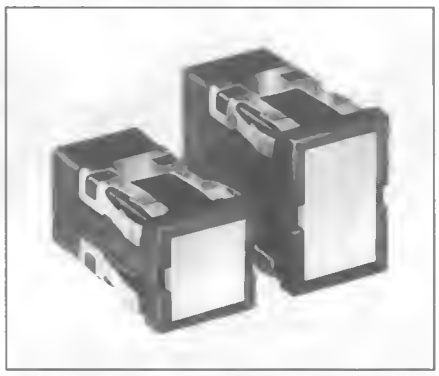
FEATURES
- Complete selection of pushbutton, rocker and paddle (toggle type) switches accommodates different functions and promotes operator efficiency.
- Solid state, electronic, and power duty control.
- Full or split screen incandescent display switches and indicators provide vivid transmitted color, projected color (for neutral display when unlit), and dead front (hidden color).
- Wide-angle visibility LED and line voltage neon display switches and indicators.
- Annunciators back-lighted by LED's enable high density message display.
- Keylock switches available for controlled access applications.
- All AML terminations at the same shallow depth (1.7 in. /43,1 mm) for convenient wiring or PC board termination.
- Snap-in surface mount or sub-panel (hidden bezel) mount with mounting hardware.
- Pad printed legends with a clear polyurethane overcoat available in a choice of five standard sizes.
- Metric design for worldwide acceptance.
- UL recognized, CSA certification.
- Selected listings are certified by VDE and CE. (For compliance status, contact the 800 number.)

MICRO SWITCH AML Advanced Manual Line combines functional flexibility with electrical versatility to provide a broad range of options to choose from.

EASY TO RELAMP

Relamping of T-1-3/4 incandescent AML91 lamps is accomplished from the front of the panel without tools. (AML92 T-1-3/4 LEDs can be added in the same manner.)

FULL GUARD BEZEL OPTION



As an alternative to standard height bezels (.06 in./1,5 mm), pushbutton switches can be furnished with full guard bezels extending .19 in./5.0 mm from the mounting surface. In the free position, standard buttons are flush with full guard bezels.

The raised bezel guards against accidental operation by someone leaning against or dropping something on a control console.

High Intensity LEDs For Full-face AML Lighted Display
AML92 Series

- Full-face illumination for high visibility lighted colors.
- Advanced illumination technology combines high-intensity LED in standard T-1-3/4 wedge base lamp package.
- Easy plug-in installation in AML lighted switches and indicators.
- Low operating temperature permits high density, continuous operation with minimal heat build-up.

AML92 Series LEDs have a quad chip assembled in a T-1-3/4 wedge base lamp package. They provide full-face illumination when used with lighted pushbutton, rocker and paddle switches, or indicators equipped with incandescent lamp sockets. For ordering information, **refer to page 58.**

Manual Switches
Advanced Manual Line

AML CHARACTERISTICS

	AML 10 Series	AML 20 Series	AML 30 Series	AML 40 Series
Electrical/Mechnical Life*				N/A
Pushbuttons–Momentary	1,000,000	25,000 (silver)/ 100,000 (gold)	25,000	---
Pushbuttons–Alternate	25,000	25,000	25,000	---
Rockers	25,000	25,000	25,000	---
Paddles	25,000	25,000	25,000	---
Agency Ratings (May not apply to every series division)				
UL	File E53576	File E12252	File E12252	File E58932
CSA	File LR4442	File LR4442	File LR4442	File LR4442
VDE	None	File 0630/10.78+	File 0630/10.78+ +	None
CE		Rating 1710 No. 4275.5788	Rating 1710 No. 4275.5788	

*95% Survival
+ Exception: Four-Pole AML's are not included in VDE Approval
+ + Exception: Only the 2-pole AML33 and AML34 are certified by VDE

AML ELECTRICAL DATA

- **AML10 Series**

Electrical Characteristics						Absolute Maximum Rating ④			
Integrated Circuit Function	Supply Current (Max.)	Output Voltage (Operated)	Output Leakage Current max. (Released)	Switching Time Max. Rise 10% to 90%	Switching Time Max. Fall 90% to 10%	Supply Voltage (V_s)	Voltage Externally Applied to Output	Loads to Output	Storage Temperature
5 VDC Sinking ①	3.5 mA (Released) 6.5mA (Operated — no load)	+.4 Volt (Sinking 8 mA)	2.0 µA	1.0µsec (Sinking 8 mA)	1.0µsec (Sinking 8 mA)	–.5 to +7.0 VDC 0° to +65°C (+32° to +149°F)	–.5 Volt min. +15 Volts max. (Off condition)	20 mA (Sinking)	–40°C to +65°C (–40° to +149°F)
6-16 VDC Sinking ②	6.5 mA @ 6 VDC. 10.0 mA @ 16 VDC (Plus load current) ③	+ .4 Volt (Sinking 20mA max.)	20 µA	1.5µsec (Sinking 20 mA)	0.5µsec (Sinking 20 mA)	–1.2 to +20 VDC	+20 VDC max. in Off condition only –0.5 VDC min. in Off or On condition.	40 mA	–40°C to +65°C (–40° to +149°F)
4.5-24 VDC Sinking	5 V 7.0 mA (Released) 24 V 9.0 mA (Released) 14.0 mA (Operated-no load)	+.4 Volt (Sinking 10 mA)	10 µA	1.5 µ sec (Sinking 10 mA)	0.5 µ sec (Sinking 10 mA)	–30 to +30 VDC	–0.5 Volt min. +24 Volts max. (Off condition)	20 mA (Sinking)	–40--C to +65°C (–40° to +149°F)

① Over temperature range of 0° to +55°C (+32° to +131°F) and supply voltage of 4.5 to 5.5 VDC.
② Over temperature range of 0° to +55°C (+32° to +131°F) and supply voltage of 16 VDC.
③ At 24°C. (+75°F)
④ As with all solid state components, performance can be expected to deteriorate as rating limits are approached; however, they will not be damaged unless the limits are exceeded.

- **AML20 Series**

Contacts	Voltage	Current	Load Type
Silver or Gold-plated Silver	250 VAC 125 VAC 24 VDC	2 Amps 3 Amps 2 Amps	75% Power Factor 75% Power Factor Resistive
Gold	125 VAC/DC	100 mA	Resistive

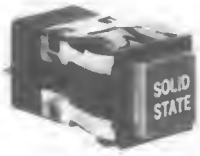
- **AML30 Series**

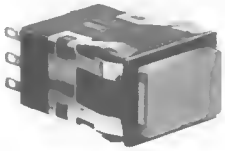
Voltage	Current: Pushbuttons	Current: Rockers or Paddles	Load Type
125 VAC	10 amps	15 amps	60% power factor
250 VAC	10 amps	15 amps	60% power factor

Manuals

Manual Switches
Solid State Pushbutton

INCANDESCENT OR NON-LIGHTED DISPLAY





Buttons ordered separately.

Electrical Data	page 19
Buttons	page 42
Lamps and LEDs	page 58
Accessories	pages 56, 57
Mounting Dimensions	pages 59, 61

FEATURES
- Hall effect reliability.
- Provides low voltage signals that interface with nearly all DC logic level loads.
- 5 VDC, 6-16 VDC and 4.5-24 VDC supply voltage.
- Full guard bezel option.
- Lamps can be furnished installed or ordered separately.
- UL recognized.
- Lamp circuit independent of switch circuit.

AML11 ORDER GUIDE

AML11 B B A 2 AA

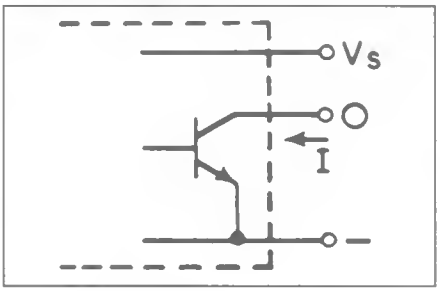
Housing Type	Bezel Color	Incandescent Lamp Type	Terminal Type
Standard Bezel: **AML11B** Square Non-Lighted **AML11C** Square 1 Lamp Ckt. **AML11E** Rect. Non-Lighted **AML11F** Rect. 1 Lamp Ckt. **AML11G** Rect. 2 Lamp Ckts. **Full Guard Bezel:** **AML11H** Square Non-Lighted **AML11J** Square 1 Lamp Ckt. **AML11K** Rect. Non-Lighted **AML11L** Rect. 1 Lamp Ckt. **AML11M** Rect. 2 Lamp Ckts.	**B** Black	**A** No Lamp Installed **B** 6 V Lamp* **C** 14 V Lamp* **E** 28 V Lamp*	**2** .110 × .020 (Solder or Quick-Connect) **3** .025 × .025 (Printed Circuit, or Push-On)

Circuitry Codes		
5 VDC Sinking	**AA** Momentary Action	**AE** Alternate Action
6-16 VDC Sinking	**BA** Momentary Action	**BE** Alternate Action
4.5-24 VDC Sinking	**DA** Momentary Action	**DE** Alternate Action

* Lamps will be installed per each lamp circuit specified in the Housing Type.

Example: **AML11BBA2AA**
Square pushbutton switch housing, non-lighted; black bezel; .110 × .020 termination; momentary action; current sinking output for use with 5 volt supply.

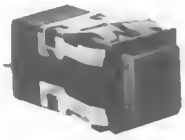
CURRENT SINKING OUTPUT AML10 SERIES



A permanent magnet plunger moves adjacent to the Hall effect integrated circuit to give a digital, current sinking normally high output.

Manual Switches
Solid State Pushbutton

LED DISPLAY



LED "window" buttons ordered separately.

LEDs are not replaceable.

FEATURES

- Hall effect reliabilty (Refer to facing page for electrical specifications.)
- Rectangular, high efficiency LED's give flush display area and wide angle indication.
- Available with or without diode protection for the LED's.
- 5 thru 24 VDC devices have an internal resistor to maintain LED current at nominal 20 mA.

Electrical Data	page 19
Buttons	pages 42, 43
Lamps and LEDs	page 58
Accessories	pages 56, 57
Mounting Dimensions	pages 59, 61

- LED circuit independent of switch circuit.
- UL recognized.

AML12 ORDER GUIDE

AML12C **B** **B** **2** **AA**

Housing Type
Standard Bezel:
AML12C Square 1 LED
Full Guard Bezel:
AML12J Square 1 LED

Bezel Color
B Black

LED Color/ Voltage	
Red	
B	V*
C	5 V
D	10 V
E	15 V
F	24 V
Yellow	
H	V*
J	5 V
K	10 V
L	15 V
M	24 V
Green	
R	V*
S	5 V
T	10 V
W	15 V
X	24 V

Terminal Type/ Diode Protection
2 .110 × .020 (Solder or Quick-Connect)
3 .025 × .025 (Printed Circuit or Push-On)
8 .110 × .020 With Diode Protection

Circuitry Codes		
5 VDC Sinking	**AA** Momentary Action	**AE** Alternate Action
6-16 VDC Sinking	**BA** Momentary Action	**BE** Alternate Action
4.5-24 VDC Sinking	**DA** Momentary Action	**DE** Alternate Action

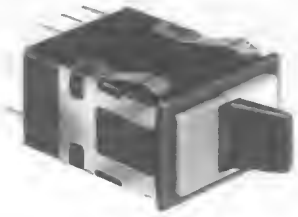
* See LED application information for devices without current-limiting resistor, page 58.

Example: **AML12CBB2AA**
Square pushbutton switch housing; black bezel; red LED; .110 × .020 termination; current sinking output for use with 5 volt supply; momentary action.

Manuals

Manual Switches
Solid State Paddle

INCANDESCENT OR NON-LIGHTED DISPLAY



Covers ordered separately.

FEATURES
- Hall effect reliability.
- Provides low voltage signals that interface with nearly all DC logic level loads.
- 5 VDC and 6-16 VDC supply voltage.
- 2 or 3-position operation.
- Toggle type paddle operators permanently installed in rectangular housings.

Electrical Data	page 19
Paddle Covers	pages 47, 48
Lamps and LEDs	page 58
Accessories	page 57
Mounting Dimensions	pages 59, 61

- Covers for the switch housing may be lighted or unlighted.
- UL recognized.
- Lamps can be furnished installed or ordered separately.
- Lamp circuit independent of switch circuit.

AML13 ORDER GUIDE

AML13 E

Housing Type

AML13 E
Rectangular
Non-Lighted

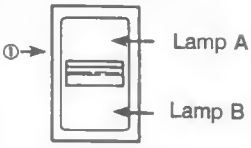
AML13 F
Rectangular
1 Lamp Ckt. (A)

AML13 G
Rectangular
2 Lamp Ckts.
(A & B)

B

Operator/Bezel Color

B
Black/Black



① The "MICRO SWITCH" identification is shown on this side of the switch housing.

A

Incandescent Lamp Type

A
No Lamp
Installed

B
6 V Lamp*

C
14 V Lamp*

E
28 V Lamp*

2

Terminal Type

2
.110 × .020
(Solder or
Quick-Connect)

3
.025 × .025
(Printed Ckt.,
or Push-On)

AA

Circuitry Code

One IC (Ckt. A):
AA
5 V Sinking

BA
6-16 V Sinking

DA
4.5-24 VDC
Sinking

Two IC's
(Ckts. A & B):
AC
5 V Sinking

BC
6-16 V Sinking

DC
4.5-24 VDC
Sinking

01

Operating Action

Insert Code
Numbers from
Operating
Action Chart

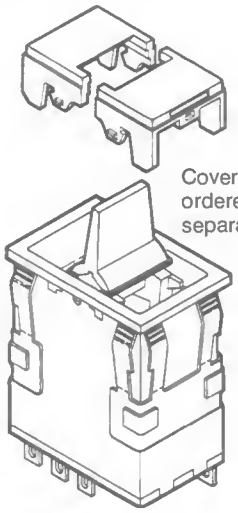
* Lamps will be installed per each lamp circuit specified in the Housing Type.

Example: **AML13EBA2AA01**
Rectangular non-lighted paddle switch housing; black paddle and bezel; .110 × .020 terminals; with one 5 V sinking IC pack; two position operation.

OPERATING ACTION

2 Position:		
Maint.	**01** None	Maint.
Mom.	**02** None	Maint.
Maint.	**03** None	Mom.
3-Position:**		
Maint.	**04** Maint.	Maint.
Mom.	**05** Maint.	Mom.
Maint.	**06** Maint.	Mom.
Mom.	**07** Maint.	Maint.

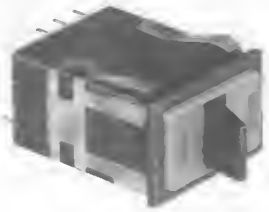
** 3-position switches must have two circuits specified in the listing (circuitry codes "AC" or "BC").



Covers ordered separately

Manual Switches
Solid State Paddle

LED DISPLAY



Covers with LED "window" ordered separately.

LEDs are not replaceable.

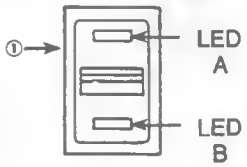
FEATURES

- Hall effect reliabilty.
- Rectangular, high efficiency LED's give flush display area and wide angle indication.
- Available with or without diode protection for the LED's.
- 5 thru 24 VDC devices have an internal resistor to maintain LED current at nominal 20 mA.
- LED circuit independent of switch circuit.
- UL recognized.

Electrical Data	page 19
Paddle Covers	pages 47, 48
Lamps and LEDs	page 58
Accessories	page 57
Mounting Dimensions	pages 59, 61

AML15 ORDER GUIDE

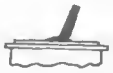
AML15 F	B	B	2	AA	01	R	X
Housing Type	**Operator Bezel Color**	**LED Voltage**	**Terminal Type/ Diode Protection**	**Circuitry Code**	**Operating Action**	**LED Color (LED A)**	**LED Color (LED B)**
AML15 F Rect. 1 LED **AML15 G** Rect. 2 LED's	**B** Black/Black	**B** V* **C** 5 V **D** 10 V **E** 15 V **F** 24 V	**2** .110 × .020 (Solder or Quick-Connect) **3** .025 × .025 (Printed Circuit, or Push-On) **8** .110 × .020 w/Diode Protection for LED	**One IC (Ckt. A):** **AA** 5 V Sinking **BA** 6-16 V Sinking **DA** 4.5-24 VDC Sinking **Two IC's (Ckts. A & B):** **AC** 5 V Sinking **BC** 6-16 V Sinking **DC** 4.5-24 VDC Sinking	Insert Code Numbers from Operating Action Chart	**R** Red **Y** Yellow **G** Green **X** No LED	**R** Red **Y** Yellow **G** Green **X** No LED

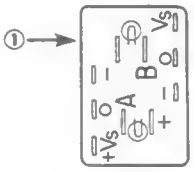


* See LED application information for devices without current-limiting resistor, page 58.

Example: **AML15FBB2AA01RX**
Rectangular paddle switch housing with one LED, without resistor, black paddle and bezel; .110 × .020 terminals, with one 5 V sinking IC pack; 2-position operation.

CIRCUIT OUTPUT STATES

			
Ckt. A	**Low** (operated)	High	High
Ckt. B	High	High	Low (operated)



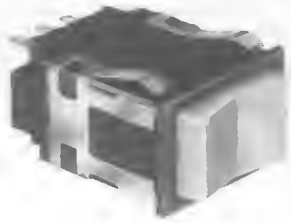
Switch base termination

① The "MICRO SWITCH" identification is on this side of the switch housing.

Manuals

Manual Switches
Solid State Rocker

INCANDESCENT OR NON-LIGHTED DISPLAY



Rocker operators ordered separately.

FEATURES

- Hall effect reliability.
- Provides low voltage signals that interface with nearly all DC logic level loads.
- 5 VDC and 6-16 VDC supply voltage.
- 2 or 3-position operation.
- UL recognized.
- Lamps can be furnished installed or ordered separately.
- Lamp circuit independent of switch circuit.

Electrical Data	page 19
Rockers	pages 51, 52
Lamps and LEDs	page 58
Accessories	page 57
Mounting Dimensions	pages 59, 61

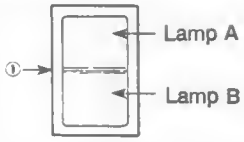
AML14 ORDER GUIDE

AML14 E — Housing Type

- **AML14 E** Rectangular Non-Lighted
- **AML14 F** Rectangular 1 Lamp Ckt. (A)
- **AML14 G** Rectangular 2 Lamp Ckts. (A & B)

B — Bezel Color

- **B** Black



① The "MICRO SWITCH" identification is shown on this side of the switch housing.

A — Incandescent Lamp Type

- **A** No Lamp Installed
- **B** 6 V Lamp*
- **C** 14 V Lamp*
- **E** 28 V Lamp*

2 — Terminal Type

- **2** .110 × .020 (Solder or Quick-Connect)
- **3** .025 × .025 (Printed Ckt., or Push-On)

AA — Circuitry Code

- **One IC (Ckt. A):**
  - **AA** 5 V Sinking
  - **BA** 6-16 V Sinking
  - **DA** 4.5-24 VDC
- **Two IC's (Ckts. A & B):**
  - **AC** 5 V Sinking
  - **BC** 6-16 V Sinking
  - **DC** 4.5-24 VDC

01 — Operating Action

- Insert Code Numbers from Operating Action Chart

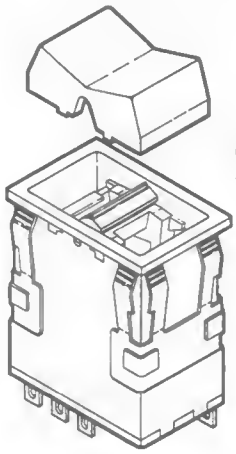
* Lamps will be installed per each lamp circuit specified in the Housing Type.

Example: **AML14EBA2AA01**
Rectangular non-lighted rocker switch housing; black bezel; .110 × .020 terminals; with one 5 V sinking IC pack; two position operation.

OPERATING ACTION

2 Position:		
Maint.	01 None	Maint.
Mom.	02 None	Maint.
Maint.	03 None	Mom.
3-Position:**		
Maint.	04 Maint.	Maint.
Mom.	05 Maint.	Mom.
Maint.	06 Maint.	Mom.
Mom.	07 Maint.	Maint.

** 3-position switches must have two circuits specified in the listing (circuitry codes "AC" or "BC").



Rockers ordered separately

Manual Switches
Solid State Rocker

LED DISPLAY

Rocker operators with LED "window" ordered separately.

LEDs are not replaceable.

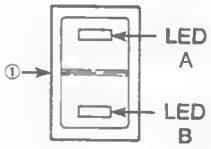
FEATURES

- Hall effect reliabilty.
- Rectangular, high efficiency LED's are flush with rocker surface, providing wide angle indication.
- Optional diode protection for the LED's.
- 5 thru 24 VDC devices have an internal resistor to maintain LED current at nominal 20 mA.
- LED circuit independent of switch circuit.
- UL recognized.

Electrical Data	page 19
Rockers	pages 51, 52
Lamps and LEDs	page 58
Accessories	page 57
Mounting Dimensions	pages 59, 61

AML16 ORDER GUIDE

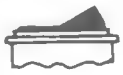
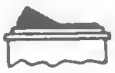
AML16 F	B	B	2	AA	01	R	X
Housing Type	**Bezel Color**	**LED Voltage**	**Terminal Type/ Diode Protection**	**Circuitry Code**	**Operating Action**	**LED Color (LED A)**	**LED Color (LED B)**
AML16 F Rect. 1 LED **AML16 G** Rect. 2 LED's	**B** Black	**B** V* **C** 5 V **D** 10 V **E** 15 V **F** 24 V	**2** .110 × .020 (Solder or Quick-Connect) **3** .025 × .025 (Printed Circuit, or Push-On) **8** .110 × .020 w/Diode Protection for LED	**One IC (Ckt. A):** **AA** 5 V Sinking **DA** 4.5-24 VDC Sinking **BA** 6-16 V Sinking **Two IC's (Ckts. A & B):** **AC** 5 V Sinking **BC** 6-16 V Sinking **DC** 4.5-24 VDC Sinking	Insert Code Numbers from Operating Action Chart	**R** Red **Y** Yellow **G** Green **X** No LED	**R** Red **Y** Yellow **G** Green **X** No LED

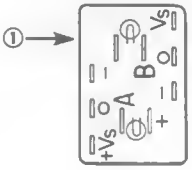


* See LED application information for devices without current-limiting resistor, page 58.

Example: **AML16FBB2AA01RX**
Rectangular 1-LED illuminated rocker switch housing, black bezel; .110 × .020 terminals, with one 5 V sinking IC pack; 2-position operation.

CIRCUIT OUTPUT STATES

			
Ckt. A	Low (operated)	High	High
Ckt. B	High	High	Low (operated)



Switch base termination

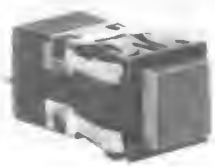
① The "MICRO SWITCH" identification is on this side of the switch housing.

Manuals

Manual Switches

Electronic Control Pushbutton

INCANDESCENT OR NON-LIGHTED DISPLAY



Buttons ordered separately.

Electrical Data	page 19
Buttons	page 43
Lamps and LEDs	page 58
Accessories	pages 56, 57
Mounting Dimensions	pages 59, 62

FEATURES

- 1, 2, or 4 poles.
- Silver or gold contacts.
- Full guard bezel option.
- Momentary or 2-level alternate action (push-on, push-off).
- UL recognized, CSA certified.
- Lamps can be furnished installed or ordered separately.
- Lamp circuit independent of switch circuit.

*AML21 Series: 1 pole and 2-pole only.

AML21 ORDER GUIDE

AML21 B — **B** — **A** — **2** — **AA**

Housing Type	Bezel Color	Incandescent Lamp Type	Terminal Type	Circuitry Codes (Each pole has double-throw)	
Standard Bezel: **AML21B** Square Non-Lighted **AML21C** Square 1 Lamp Ckt. **AML21E** Rect. Non-Lighted **AML21F** Rect. 1 Lamp Ckt. **AML21G** Rect. 2 Lamp Ckts. **Full Guard Bezel:** **AML21H** Square Non-Lighted **AML21J** Square 1 Lamp Ckt. **AML21K** Rect. Non-Lighted **AML21L** Rect. 1 Lamp Ckt. **AML21M** Rect. 2 Lamp Ckts.	**B** Black	**A** No Lamp Installed **B** 6 V Lamp* **C** 14 V Lamp* **E** 28 V Lamp*	**2** .110 × .020 (Solder or Quick-Connect) **3** .025 × .025 (Printed Ckt. or Push-On)	Silver Contacts	Mom. Action **AA** 1-Pole **AC** 2-Pole **CC** 4-Pole
					Alt. Action **AB** 1-Pole **AD** 2-Pole **CD** 4-Pole
				Gold Contacts	Mom. Action **BA** 1-Pole **BC** 2-Pole **DC** 4-Pole
					Alt. Action **BB** 1-Pole **BD** 2-Pole **DD** 4-Pole
				Gold-Plated Silver Contacts	Mom. Action **EA** 1-Pole **EC** 2-Pole
					Alt. Action **EB** 1-Pole **ED** 2-Pole

* Lamps will be installed per each lamp circuit specified in the Housing Type.

Example: **AML21BBA2AA**
Square pushbutton switch housing non-lighted; black bezel; .110 × .020 termination; momentary action; 1-pole, double-throw; silver contacts.

Manual Switches

Electronic Control Pushbutton

LED DISPLAY

Buttons with LED "window" ordered separately.

LEDs are not replaceable.

FEATURES

- Identical to AML21 switches, except furnished with high efficiency LED display.
- Rectangular LED's are flush with button surface, providing wide angle indication.
- Optional diode protection for LED's.
- 5 thru 24 VDC LED devices have an internal resistor to maintain current at nominal 20 mA.
- UL recognized, CSA certified.
- LED circuit independent of switch circuit.

Electrical Data	page 19
Buttons	pages 42, 43
Lamps and LEDs	page 58
Accessories	pages 56, 57
Mounting Dimensions	pages 59, 62

*AML22 Series: 1 pole and 2-pole only.

AML22 ORDER GUIDE

AML22 C **B** **B** **2** **AA**

Housing Type	Bezel Color	LED Color/ Voltage	Terminal Type	Circuitry Codes (Each pole has double-throw)	
Standard Bezel: **AML22C** Square 1 LED **AML22H** Square 1 High-Profile LED (For use with AML52-A buttons) **Full Guard Bezel:** **AML22J** Square 1 LED	**B** Black	**Red** **B** V* **C** 5V **D** 10V **E** 15V **F** 24V **Yellow** **H** V* **J** 5V **K** 10V **L** 15V **M** 24V **Green** **R** V* **S** 5V **T** 10V **W** 15V **X** 24V	**2** .110 × .020 (Solder or Quick-Connect) **3** .025 × .025 (Printed Ckt., or Push-On) **8** .110 × .020 With Diode Protection for LED	Silver Contacts	Mom. Action **AA** 1-Pole **AC** 2-Pole **CC** 4-Pole
					Alt. Action **AB** 1-Pole **AD** 2-Pole **CD** 4-Pole
				Gold Contacts	Mom. Action **BA** 1-Pole **BC** 2-Pole **DC** 4-Pole
					Alt. Action **BB** 1-Pole **BD** 2-Pole **DD** 4-Pole
				Gold-Plated Silver Contacts	Mom. Action **EA** 1-Pole **EC** 2-Pole
					Alt. Action **EB** 1-Pole **ED** 2-Pole

* See LED information for devices without current limiting resistor, page 58.

Example: **AML22CBB2AA**
Square pushbutton switch housing with one LED, black bezel; red LED (without resistor); .110 × .020 termination; momentary action, 1-pole, double-throw; silver contacts.

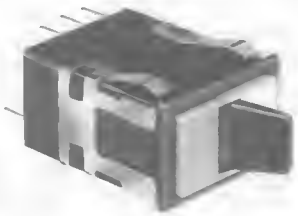
CONTACT ARRANGEMENT

1, 2 or 4 poles: Form C

Manuals

Manual Switches
Electronic Control Paddle

INCANDESCENT OR NON-LIGHTED DISPLAY



Covers ordered separately.

FEATURES

- Silver or gold contacts.
- 1, 2 or 4 poles.
- Toggle type paddle operators permanently installed in rectangular housings.
- Covers for the switch housing may be lighted or unlighted.
- UL recognized, CSA certified.
- Lamps can be furnished installed or ordered separately.
- Lamp circuit independent of switch circuit.

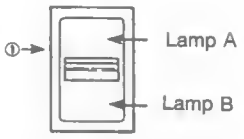
Electrical Data	page 19
Paddle Covers	page 47
Lamps and LEDs	page 58
Accessories	page 57
Mounting Dimensions	pages 59, 62

*AML23 Series: 1 pole and 2-pole only.

*AML23 ORDER GUIDE

AML23 E	B	A	2	AA	01
Housing Type	**Operator/Bezel Color**	**Incandescent Lamp Type**	**Terminal Type**	**Circuitry Codes**	**Operating Action**
AML23 E Rectangular Non-Lighted **AML23 F** Rectangular 1 Lamp Ckt. (A) **AML23 G** Rectangular 2 Lamp Ckts. (A & B)	**B** Black/Black	**A** No Lamp Installed **B** 6 V Lamp* **C** 14 V Lamp* **E** 28 V Lamp*	**2** .110 × .020 (Solder or Quick-Connect) **3** .025 × .025 (Printed Ckt., or Push-on)	Insert Code letters as shown in Circuitry Chart	Insert Code numbers from Operating Action Chart

* Lamps will be installed per each lamp circuit specified in the Housing Type.



① The "MICRO SWITCH" identification is shown on this side of the switch housings.

Example: **AML23EBA2AA01**
Rectangular non-lighted paddle switch housing; black paddle and bezel; .110 × .020 terminals; with one circuit ON and one circuit OFF in each extreme operator position (maintained).

CIRCUITRY

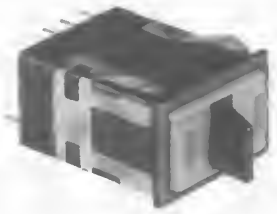
Silver Contacts	Gold Contacts	2-Position		3-Position		
AA	BA	3 2 1	3 2 1	3 2 1	3 2 1	3 2 1
AC	BC	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4
(Non-illuminated switches only)						
CA	DA	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4
CC	DC	3 2 1 6 5 4 9 8 7 12 11 10	3 2 1 6 5 4 9 8 7 12 11 10	3 2 1 6 5 4 9 8 7 12 11 10	3 2 1 6 5 4 9 8 7 12 11 10	3 2 1 6 5 4 9 8 7 12 11 10
(Non-illuminated switches only)						

OPERATING ACTION

2-Position:		
Maint.	**01** None	Maint.
Mom.	**02** None	Maint.
Maint.	**03** None	Mom.
3-Position:		
Maint.	**04** Maint.	Maint.
Mom.	**05** Maint.	Mom.
Maint.	**06** Maint.	Mom.
Mom.	**07** Maint.	Maint.

Manual Switches
Electronic Control Paddle

LED DISPLAY



Covers with LED "window" ordered separately.

FEATURES

- Identical to AML23, except furnished with one or two rectangular high efficiency LED's which give flush display area and wide angle indication.
- Available with or without diode protection for LED's.
- LED circuit independent of switch circuit.

Electrical Data	page 19
Paddle Covers	page 48
Lamps and LEDs	page 58
Accessories	page 57
Mounting Dimensions	pages 59, 62

- 5 thru 24 VDC devices have internal resistor to maintain current at nominal 20 mA.
- UL recognized, CSA certified.

*AML25 Series: 1 pole and 2-pole only.

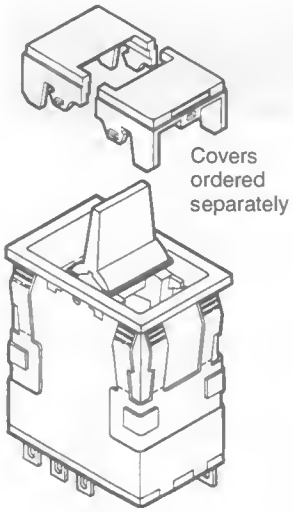
AML25 ORDER GUIDE

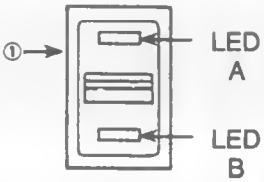
AML25 F	B	B	2	AA	01	R	X
Housing Type	**Operator/ Bezel Color**	**LED Voltage**	**Terminal Type/ Diode Protection**	**Circuitry Codes**	**Operating Code**	**LED Color (LED A)**	**LED Color (LED B)**
AML25 F Rectangular 1 LED **AML25 G** Rectangular 2 LED's	**B** Black/Black	**B** V* **C** 5 V **D** 10 V **E** 15 V **F** 24 V	**2** .110 × .020 (Solder or Q-C) **3** .025 × .025 (Printed Ckt., or Push-On **8** .110 × .020 w/Diode protection	Insert code letters as shown in Circuitry Chart LED version available only with **AA** **BA** **CA** **DA** circuitry	Insert code numbers from Operating Action Chart	**R** Red **Y** Yellow **G** Green **X** No LED	**R** Red **Y** Yellow **G** Green **X** No LED

*See LED application information for devices without current-limiting resistor, page 58.

Example: **AML25FBB2AA01RX**
Rectangular paddle switch; illuminated with one red LED, this device has a black paddle and bezel, and .110 × .020 terminals; with one circuit ON and one circuit OFF in each extreme operator position (maintained).

NOTE: For further information on replacement LED's, call the 800 number.



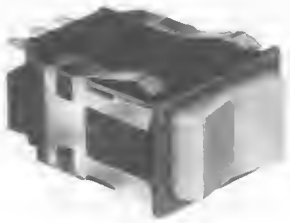


① The "MICRO SWITCH" identification is shown on this side of the switch housings.

Manuals

Manual Switches
Electronic Control Rocker

INCANDESCENT OR NON-LIGHTED DISPLAY



Rocker operators ordered separately.

FEATURES

- Silver or gold contacts.
- 2 or 3 position operation.
- UL recognized, CSA certified.
- Lamps can be furnished installed or ordered separately.
- Lamp circuit independent of switch circuit.

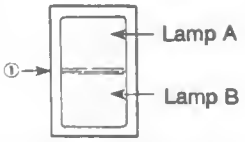
Electrical Data	page 19
Rockers	page 51
Lamps	page 58
Accessories	pages 56, 57
Mounting Dimensions	pages 59, 62

*AML24 Series: 1 pole and 2-pole only.

AML24 ORDER GUIDE

AML24 E	B	A	2	AA	01
Housing Type	**Bezel Color**	**Incandescent Lamp Type**	**Terminal Type**	**Circuitry Codes**	**Operating Action**
AML24 E Rectangular Non-Lighted **AML24 F** Rectangular 1 Lamp Ckt. (A) **AML24 G** Rectangular 2 Lamp Ckts.	**B** Black	**A** No Lamp Installed **B** 6 V Lamp* **C** 14 V Lamp* **E** 28 V Lamp*	**2** .110 × .020 (Solder or Quick-Connect) **3** .025 × .025 (Printed Ckt., or Push-on)	Insert Code letters as shown in Circuitry Chart	Insert Code numbers from Operating Action Chart

* Lamps will be installed per each lamp circuit specified in the Housing Type.



① The "MICRO SWITCH" identification is shown on this side of the switch housings.

Example: **AML24EBA2AA01**
Rectangular non-lighted rocker switch housing; black bezel; .110 × .020 terminals; with one circuit ON and one circuit OFF in each extreme operator position (maintained).

CIRCUITRY

Silver Contacts	Gold Contacts	2-Position		3-Position			
AA	BA	3 2 1	3 2 1	3 2 1	3 2 1	3 2 1	①
AC (Non-illuminated switches only)	BC	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	
CA	DA	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	
CC (Non-illuminated switches only)	DC	3 2 1 6 5 4 9 8 7 12 11 10	3 2 1 6 5 4 9 8 7 12 11 10	3 2 1 6 5 4 9 8 7 12 11 10	3 2 1 6 5 4 9 8 7 12 11 10	3 2 1 6 5 4 9 8 7 12 11 10	

OPERATING ACTION

2-Position:		
Maint.	01 None	Maint.
Mom.	02 None	Maint.
Maint.	03 None	Mom.
3-Position:		
Maint.	04 Maint.	Maint.
Mom.	05 Maint.	Mom.
Maint.	06 Maint.	Mom.
Mom.	07 Maint.	Maint.

Manual Switches

Electronic Control Rocker

LED DISPLAY

Rocker operators ordered separately.

LEDs are not replaceable.

FEATURES

- Identical to AML24, except furnished with one or two rectangular high efficiency LED's which give flush display area and wide angle indication.
- Available with or without diode protection for LED's.
- LED circuit independent of switch circuit.

Electrical Data	page 19
Rockers	page 52
Lamps and LEDs	page 58
Accessories	page 57
Mounting Dimensions	pages 59, 62

- 5 thru 24 VDC LED devices have internal resistor to maintain current at nominal 20 mA.
- UL recognized, CSA certified.

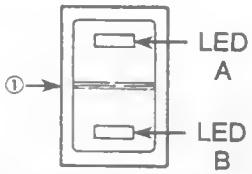
*AML26 Series: 1 pole and 2-pole only.

AML26 ORDER GUIDE

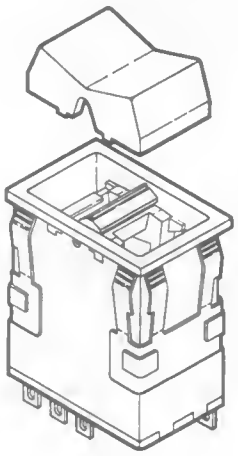
AML26 F	B	B	2	AA	01	R	X
Housing Type	**Bezel Color**	**LED Voltage**	**Terminal Type/ Diode Protection**	**Circuitry Codes**	**Operating Action**	**LED Color (LED A)**	**LED Color (LED B)**
AML26 F 1 LED **AML26 G** 2 LED's	**B** Black	**B** V* **C** 5 V **D** 10 V **E** 15 V **F** 24 V	**2** .110 × .020 (Solder or Quick-Connect **3** .025 × .025 (Printed Ckt., or Push-On) **8** .110 × .020 w/Diode for LED protection	Insert code letters as shown in Circuitry Chart LED version available only with **AA** **BA** **CA** **DA** circuitry	Insert code numbers from Operating Action Chart	**R** Red **Y** Yellow **G** Green **X** No LED	**R** Red **Y** Yellow **G** Green **X** No LED

*See LED application information for devices without current-limiting resistor, page 58.

Example: **AML26FBB2AA01RX**
Rectangular rocker switch; illuminated with one LED, this device has a black bezel, .110 × .020 terminals; with one circuit ON and one circuit OFF in each extreme operator position (maintained).



① The "MICRO SWITCH" identification is shown on this side of the switch housings.



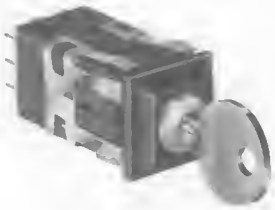
Rocker ordered separately

Manuals

Manual Switches

Electronic Control Keylock

NON-LIGHTED



FEATURES

- Enable control of access to computer peripherals, keyboards, point-of-sale terminals, and security systems which are locked when unattended; and other locations where tampering must be discouraged.
- 2 or 3 positions, maintained (90° throw) and momentary action (60° throw).
- 5-bit key combinations

Electrical Data	page 19
Accessories	pages 56, 57
Mounting Dimensions	pages 59, 62

- UL recognized, CSA certified.
- Static discharge protection (up to 20 kV when grounded).

AML27 ORDER GUIDE

AML27 A B K 2 AA 21 BA

Housing Type	Bezel Color	Button Color	Terminal Type	Circuitry Codes (Each pole has double-throw)
AML27 A Square housing Non-Lighted	**B** Black	**K** Black	**2** .110 × .020 (Solder or Quick-Connect) **3** .025 × .025 (Printed Circuit or Push-On)	**Silver Contacts:** **AA** 1 pole **AC** 2 pole **Gold Contacts:** **BA** 1 pole **BC** 2 pole

Operation Action (Key out in center position, except where noted)

CCW	Center	CW
None	**21** Maint.	Maint.
None	**22*** Maint.	Maint.
None	**23** Maint.	Mom.
Maint.	**24** Maint.	Maint.
Mom.	**25** Maint.	Mom.
Maint.	**26**** Maint.	Maint.
Mom.	**27***** Maint.	Maint.
Maint.	**28***** Maint.	Maint.
Maint.	**29†** Maint.	Maint.
Maint.	**30†** Maint.	Mom.
Maint.	**31††** Maint.	Mom.

* Key out in both positions.
** Key out in all three positions.
*** Key out in center and CW positions.

† Key out in center and CCW positions.
†† Key out in CCW only.

Key Combinations ⚠

(Two Keys Furnished)

BA	**BL**
BB	**BM**
BC	**BN**
BD	**BP**
BE	**BQ**
BF	**BR**
BG	**BS**
BH	**BT**
BJ	**BV**
BK	**BW**

28 and **29** operating actions should be used with Key Combinations BA, BB, BG or BK.

REPLACEMENT KEYS

One key per listing.

Key Combination	Key Code	Catalog Listing
BA	110	30PA101-AML
BB	109	30PA102-AML
BC	108	30PA103-AML
BD	107	30PA104-AML
BE	106	30PA105-AML
BF	105	30PA106-AML
BG	104	30PA107-AML
BH	103	30PA108-AML
BJ	102	30PA109-AML
BK	101	30PA110-AML
BL	111	30PA111-AML
BM	112	30PA112-AML
BN	113	30PA113-AML
BP	114	30PA114-AML
BQ	115	30PA115-AML
BR	116	30PA116-AML
BS	117	30PA117-AML
BT	118	30PA118-AML
BV	119	30PA119-AML
BW	120	30PA120-AML

Note: These keys fit the 5-bit keylocks in the Order Guide.

⚠ Specify different Key Combinations to acquire different keys, i.e.; AML27ABK2AA21**BB** and AML27ABK2AA21**BK** have different keys. AML27ABK2AA21**BB** and AML27ABK3BC25**BB** have identical interchangeable keys.

Example: **AML27ABK2AC28BB**
Square housing; black bezel and button; .110 × .020 terminals; 2-pole double-throw; silver contacts; 3-position maintained and key code "BB".

CIRCUITRY

2-Position Switches:

	Normal Position*	Key Turned to Right (CW)
1 Pole	3 2 1	3 2 1
2 Pole	3 2 1 6 5 4	3 2 1 6 5 4

3-Position Switches (Available in 2-pole only.)

	Key Turned to Left (CCW)	Normal Position*	Key Turned to Right (CW)
2 Pole	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4

* Circuit remains the same with key in or out.

Manual Switches
Power Duty Pushbutton

INCANDESCENT, NEON, OR NON-LIGHTED DISPLAY

Buttons ordered separately.

Electrical Data	page 19
Buttons	page 42
Lamps and LEDs	page 58
Accessories	pages 56, 57
Mounting Dimensions	page 60

FEATURES
- UL recognized, CSA certified.
- AML31 lamp circuit independent of switch circuit.

*AML31 Series: 2-pole.
*AML32 Series: 2-pole.

CONTACT ARRANGEMENT

2 poles (Form X)

AML31 ORDER GUIDE

AML31 accepts one incandescent lamp which can be furnished installed or ordered separately.

AML31 E — **B** — **A** — **4** — **AC**

Housing Type	Bezel Color	Incandescent Lamp Type	Terminal Type	Circuitry Codes
Standard Bezel: **AML31E** Rect. Non-Lighted **AML31F** Rect. 1 Lamp Ckt. **Full Guard Bezel:** **AML31K** Rect. Non-Lighted **AML31L** Rect. 1 Lamp Ckt.	**B** Black	**A** No Lamp Installed **B** 6 V Lamp* **C** 14 V Lamp* **E** 28 V Lamp*	**4** .187 × .020 (Solder or Quick-Connect	2-Pole, Single-Throw Normally-Open, Form X: **AD** Alt. Action **AC** Mom. Action

* Lamps will be installed per each lamp circuit specified in the Housing Type.

Example: **AML31EBA4AC**
Rectangular pushbutton switch housing, non-lighted; black bezel; .187 × .020 terminals; momentary action; 2-pole, single-throw, normally open, Form X.

AML32 ORDER GUIDE

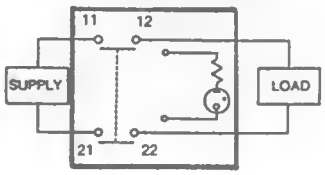
AML32 has neon lamp wired to 125 or 250 VAC resistor.

AML32 F — **B** — **C** — **7** — **AC**

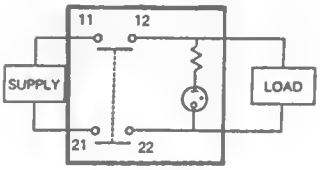
Housing Type	Bezel Color	Neon Lamp Voltage/Color	Terminal Type Lamp Circuit	Circuitry Codes
Standard Bezel: **AML32F** Rect. 1 Neon Lamp **Full Guard Bezel:** **AML32L** Rect. 1 Neon Lamp	**B** Black	**Red** **B** 125 VAC **C** 250 VAC **Clear** **K** 125 VAC **L** 250 VAC **Green** **M** 125 VAC **P** 250 VAC	**4** .187 × .020 (Solder or Quick-Connect) with isolated lamp circuit **7** .187 × .020 with integral lamp circuit	2-Pole, Single-Throw Normally-Open, Form X: **AD** Alt. Action **AC** Mom. Action

Example: **AML32FBC7AC**
Rectangular pushbutton switch housing; black bezel; 250 volt, red neon lamp; .187 × .020 terminals with integral lamp circuit; momentary action; 2-pole, single-throw, normally open, Form X.

Isolated neon circuit



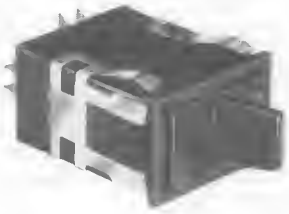
Integral neon circuit

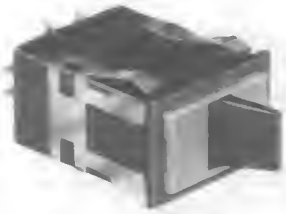


Manuals

Manual Switches
Power Duty Paddle

INCANDESCENT, NEON, OR NON-LIGHTED DISPLAY





Colored housing covers ordered separately.

Electrical Data	page 19
Paddle Covers	page 47
Lamps	page 58
Mounting Dimensions	page 60

FEATURES

- Toggle type paddle operators permanently installed in rectangular housings.
- 2-position maintained action.
- AML33 lamp circuit independent of switch circuit.
- UL recognized, CSA certified.

*AML33 Series: 2-pole only.
*AML35 Series: 1-pole and 2-pole.

CONTACT ARRANGEMENT

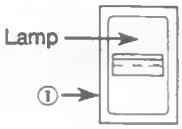
1 or 2 poles: Form A

AML33 ORDER GUIDE

AML33 accepts one incandescent lamp which can be furnished installed or ordered separately.

AML33 E — Housing Type
- **AML33 E** Rectangular Non-Lighted
- **AML33 F** Rectangular 1 Lamp Ckt.

B — Operator/Bezel Color
- **B** Black/Black



A — Incandescent Lamp Type
- **A** No Lamp Installed
- **B** 6 V Lamp*
- **C** 14 V Lamp*
- **E** 28 V Lamp*

4 — Terminal Type
- **4** .187 × .020 (Solder or Quick-Connect)

AA — Circuitry Codes
- **Silver Contacts:**
- **AA** 1-Pole (One Form A Single-throw, Normally-Open)
- **AC** 2-Pole (Two Form A)

01 — Operating Action

01
Maint. ON — Maint. OFF

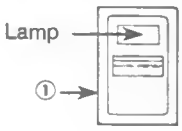
*Lamps will be installed per each lamp circuit specified in the Housing Type.

AML35 ORDER GUIDE

AML35 has neon lamp wired to 125 or 250 VAC resistor.

AML35 F — Housing Type
- **AML35 F** Rectangular 1 Neon Lamp

B — Operator/Bezel Color
- **B** Black/Black



B — Neon Lamp Voltage
- **Red**
- **B** 125 VAC
- **C** 250 VAC
- **Green**
- **M** 125 VAC
- **P** 250 VAC

4 — Terminal Type/ Lamp Circuit †
- **4** .187 × .020 (Solder or Quick-Connect) With Isolated Lamp Circuit
- **7** .187 × .020 With Integral Lamp Circuit (Available with 2-Pole devices only

AA — Circuitry Codes
- **Silver Contacts:**
- **AA** (One Form A Single-Throw) Available only with isolated lamp circuit, term. type 4.
- **AC** 2-Pole (Two Form A)

01 — Operating Action

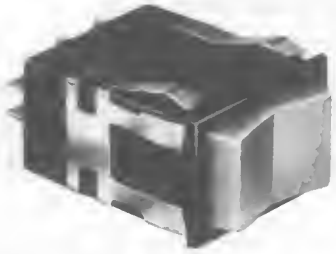
01
Maint. ON — Maint. OFF

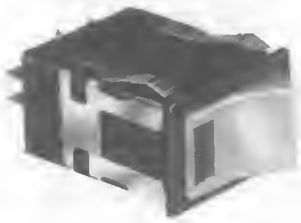
① The "MICRO SWITCH" identification is shown on this side of the switch housing.

Example: **AML35FBB4AA01**
Rectangular paddle switch housing; black paddle and bezel; 125 VAC neon lamp; .187 × .020 terminals with isolated lamp circuit; 1-Pole Form A Single-Throw; with circuit ON in one extreme position and OFF in the other (maintained).

Manual Switches
Power Duty Rocker

INCANDESCENT, NEON, OR NON-LIGHTED DISPLAY





Rocker operators ordered separately.

Electrical Data	page 19
Rockers	page 51
Lamps	page 58
Mounting Dimensions	page 60

FEATURES
- Same circuitry, and electrical rating as power duty paddle switches.
- Neon lamp circuitry can be isolated or integral on 2-pole switches; isolated-only on 1-pole switches (see schematics).
- UL recognized, CSA certified.
- AML34 lamp circuit independent of switch circuit.

AML34 Series: 2-pole only.
AML36 Series: 1-pole and 2-pole.

AML34 ORDER GUIDE

AML34 accepts one incandescent lamp which can be furnished installed or ordered separately.

AML34 E

Housing Type
AML34 E Rectangular Non. Illum.
AML34 F Rectangular 1 Lamp Ckt.

B

Bezel Color
B Black

① → Lamp

A

Incandescent Lamp Type
A No Lamp Installed
B 6 V Lamp*
C 14 V Lamp*
E 28 V Lamp*

4

Terminal Type
4 .187 × .020 (Solder or Quick-Connect)

AA

Circuitry Codes
Silver Contacts: AA 1-Pole (One Form A Single-Throw)
AC 2-Pole (Two Form A)

01

Operating Action
① **01** Maint. ON / Maint. OFF

*Lamps will be installed per each lamp circuit specified in the Housing Type.

AML36 ORDER GUIDE

AML36 has neon lamp wired to 125 or 250 VAC resistor.

AML36 F

Housing Type
AML36 F Rectangular 1 Neon Lamp

B

Bezel Color
B Black

① → Lamp

B

Neon Lamp Voltage
Red **B** 125 VAC
C 250 VAC
Green **M** 125 VAC
P 250 VAC

4

Terminal Type/ Lamp Circuit
4 .187 × .020 (Solder or Quick-Connect) With Isolated Lamp Circuit
7 .187 × .020 (Solder or Quick-Connect) With Integral Lamp Circuit

AA

Circuitry Codes
Silver Contacts: AA (One Form A Single-Throw) Not available with terminal type 7
AC 2-Pole (Two Form A)

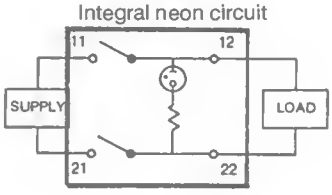
01

Operating Action
① **01** Maint. ON / Maint. OFF

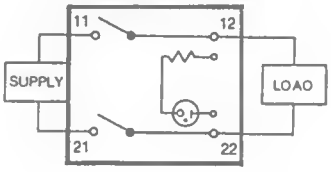
① The "MICRO SWITCH" identification is shown on this side of the switch housing.

Example: **AML36FBB4AA01**
Rectangular rocker switch housing; black bezel; 125 VAC neon lamp; .187 × .020 terminals with isolated lamp circuit; 1-Pole Form A single-throw; with circuit ON in one extreme position and OFF in the other.

Integral neon circuit



Isolated neon circuit



Manuals

To order lamps see page 58.

FEATURES

- Pushbutton style indicators match display of standard bezel lighted switches. Choice of incandescent or LED illumination.
- Lens style indicators use a special cap-like button which covers the bezel to present a larger display area, without affecting family appearance. Up to 3-lamp split screen capability. Incandescent illumination.

AML41
(Use AML51 push-buttons only. Page 42.)

AML41
(Use AML51-J/-K/-L lens buttons only. Page 42.)

AML41 INCANDESCENT DISPLAY INDICATORS ORDER GUIDE

AML41 C B A 2

Housing Type: Pushbutton Style:	Housing Type: Lens Style:	Bezel Color	Incand. Lamp Type	Terminal Type
AML41 C Square 1 lamp ckt.	**AML41 J** Rectangular 1 lamp ckt.	**B** Black	**A** No lamp installed	**2** .110 × .020 (Solder or Quick-Connect)
AML41 D Square 2 lamp ckts.	**AML41 K** Rectangular 2 lamp ckts.		**B** 6 V Lamp*	**3** .025 × .025 (Printed Circuit or Push-On)
AML41 F Rectangular 1 lamp ckt.	**AML41 L** Rectangular 3 lamp ckts.		**C** 14 V Lamp*	
AML41 G Rectangular 2 lamp ckts.			**E** 28 V Lamp*	

* Lamps will be installed per each lamp circuit specified in the Housing Type.

Examples:

AML41CBA2
Square (pushbutton style) indicator housing with one lamp circuit; black bezel; .110 × .020 termination.

AML41JBA2
Rectangular (lens style) indicator housing with one lamp circuit; black bezel; .110 × .020 termination.

AML42C
(Use AML52-C/-A pushbuttons only. Page 43.)

AML42S

AML42 LED DISPLAY INDICATORS ORDER GUIDE

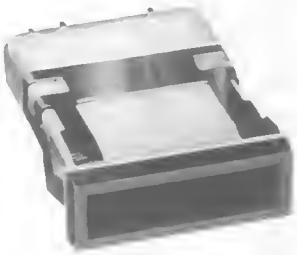
LEDs are not replaceable.

AML42 S B C 2

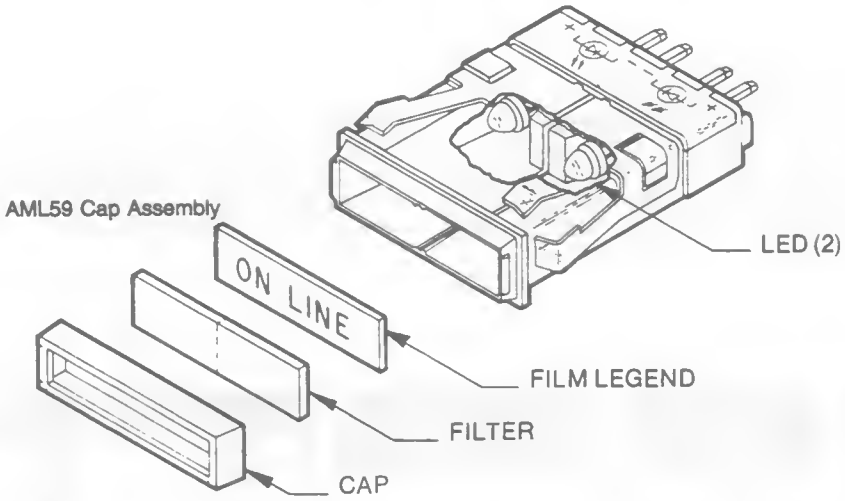
Housing Type	Bezel Color	LED Color/ Voltage	Terminal Type/ Diode Protection: 2	Terminal Type/ Diode Protection: 8
AML42 C Square 1 LED	**B** Black	**Red** B V*, C 5 V, D 10 V, E 15 V, F 24 V	**2** .110 × .020 (Solder or Q.C.)	.110 × .020 w/diode to protect LED
AML42 S Compact 1 LED		**Yellow** H V*, J 5 V, K 10 V, L 15 V, M 24 V	**3** .025 × .025 (Printed Circuit or Push-On)	**9** .025 × .025 w/diode to protect LED
		Green R V*, S 5 V, T 10 V, W 15 V, X 24 V		

Example: **AML42SBC2**
Compact indicator with black bezel; 5 volt red LED; .110 × .020 termination.

* See LED application data, page 58, for these devices without current-limiting resistor.



AML45 Housing



FEATURES

- Messages are backlighted with LED's for long, reliable operating life. Reduces service and maintenance costs.
- Low voltage and current (without inrush), enables direct drive with integrated circuits. Reduces cost of interface components (and installation), and power supply.
- Low operating temperature allows high-density, continuous operation. Minimal heat build-up.
- Inherently rugged. Resists effects of shock and vibration (no filaments to break).
- High density message display. Illuminates up to four legend sectors in color, in a 0.8 × 1.2 inch area.
- Dead front hides legends until illuminated. Non-glare display with no flickering.
- UL recognized.

AML45/59 solid state LED annunciators are a state-of-the-art advancement over traditional back-lighted legend displays which utilize incandescent lamps. The LED light source imparts the benefits of solid state long-life and reliability, with low power requirements. Operating life is measured by years, instead of hours.

The AML45 housing has two high efficiency LED's which illuminate color filters and film legends located in the snap-on AML59 cap assembly. There is a choice of full face one-color and split one-color or two-color displays. Color options are red, green, and yellow.

Film legends offer a choice of negative or positive formats. (Note: human factors engineers generally favor negative annunciator messages, reserving the positive format for use if special attention is necessary, such as "PAPER JAM.")

When unlighted, the legend is hidden (dead front).

NEGATIVE

When illuminated, colored legend appear1001s against a black background.

NEGATIVE

POSITIVE

When illuminated, black legend appears against a colored background.

POSITIVE

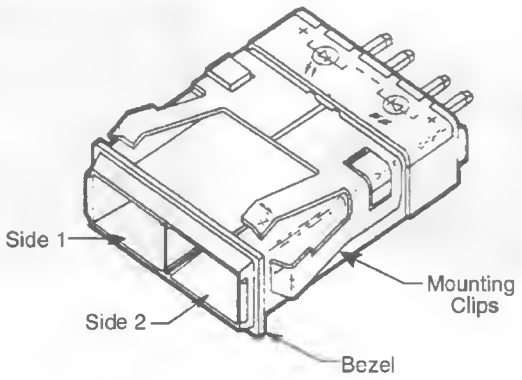
This annunciator is totally compatible with other deivces in the MICRO SWITCH AML Advanced Manual Line both in front of, and behind the panel. Two of them fit in the same space as a rectangular AML indicators or switch. All terminals exit at AML's standard 1.7-inch depth for convenient, single-level wiring.

AML45 LED HOUSINGS

LEDs should be specified as the same color if a full or split screen one-color display is desired (RR = red); or different colors for a split screen two-color display (RY = red/yellow). (Baffle plate inside housing prevents light spillage from one LED color section to the other on split screen versions.)

LED colors should match filter colors specified in AML59 cap assembly (see page 40).

Spring clips on sides of the housing hold units securely in panel. For mounting strips of two or more units, AML61 mounting hardware may be used (see page 55).



LED APPLICATION INFORMATION

Refer to page 59.

PANEL ORIENTATION

Drawing (above) indicates Side 1 and Side 2 LED locations, with MICRO SWITCH identifications facing UP. Consider this orientation when ordering an **AML45S** housing with two different LED colors, such as RG (red/Side 1, green/Side 2). Since LED's are permanently installed, color location is specially important to note when the device is to be terminated in a printed circuit board.

AML45 ORDER GUIDE

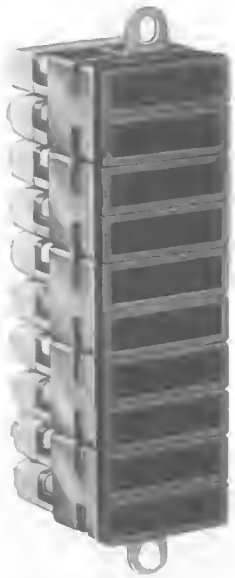
AML45 S	W	A	2	RY
Housing Type	**Color of Housing Bezel**	**LED Voltage***	**Terminal Type**	**LED Color**
AML45 R 2 LED's (For use with Full Screen) **AML45 S** 2 LED's (For use with Split Screen)	**W** White **K** Black	**A** 2.4 V **B** 5 V **C** 10 V **D** 15 V **F** 24 V	**2** .110 × .020 (Solder or Quick-Connect) **3** .025 × .025 (Printed Circuit) **8** .110 × .020 with diode protection for LED's	**Side 1**: **R** Red, **Y** Yellow, **G** Green **Side 2**: **R** Red, **Y** Yellow, **G** Green

* Current draw is 20 mA. "B", "C", "D" and "F" have built-in current limiting resistors.

Example: **AML45SWA2RY**
Split screen type housing with white bezel, 2.4 V LED's, .110 × .020 termination, red LED in Side 1 and yellow LED in Side 2.

Manual Switches
Solid State Annunciators

SUBPANEL MOUNTING



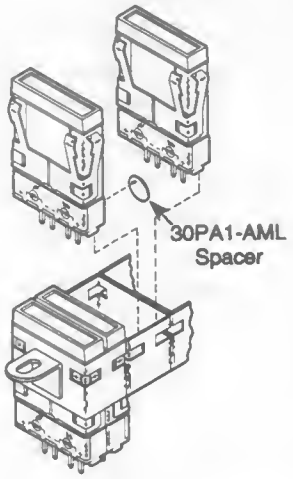
Order AML45/59 annunciators and AML61 mounting hardware separately.

AML61 mounting hardware may be used for mounting strips of two or more annunciators in pairs in a single cutout. This method is most cost-effective for multi-unit application, since it generally takes less time to make one large hole to accept several units than it does to make a hole for each individual unit. Also, if the front panel is not required for mounting support, it can be made thinner, and easier to cut out, minimizing installed cost.

AML61 strips are factory assembled with metal cans welded together, and mounting brackets welded to the end cans. Refer to page 45 for ordering information.

INSTALLATION

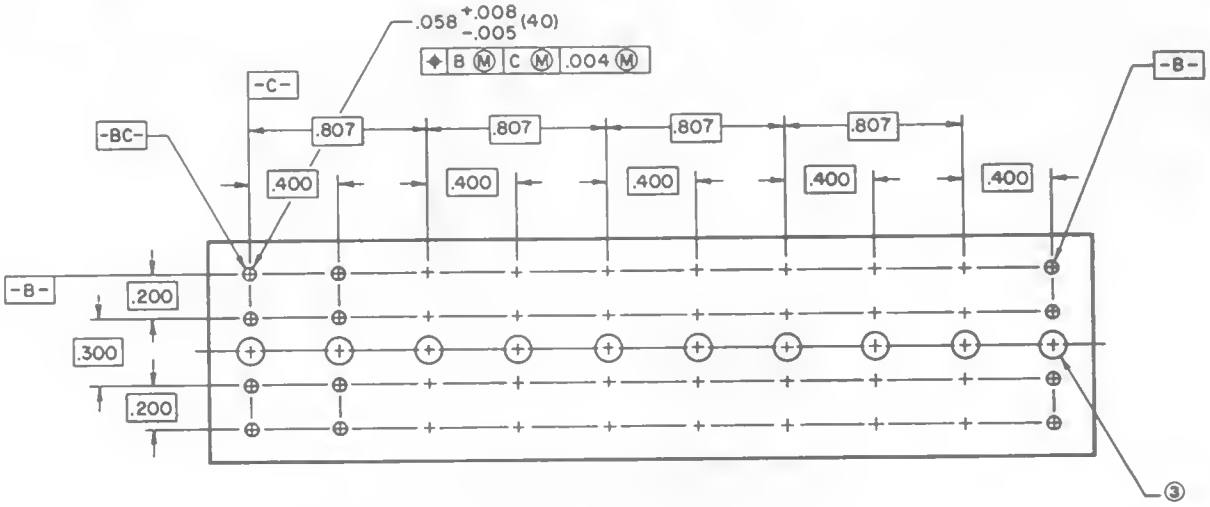
Each rectangular AML61 mounting can will accommodate two annunciators, as shown in the drawing. Panel appearance is enhanced if a spacer .05 in./1,3 mm thick (approx.) is installed between the housings at the terminal end. Specify Catalog Listing 30PA1-AML for a package of 10 spacers.



Mounting centers and panel cutout dimensions are shown on page 64. An installation instruction sheet PK8520 is shipped with each order.

PRINTED CIRCUIT BOARD DIMENSIONS

Suggested printed circuit board layout for up to ten AML45 units assembled in an AML61 assembly:



③ .125" minimum diameter hole recommended to permit access to annunciator, allowing it to be driven out panel front should replacement become necessary.

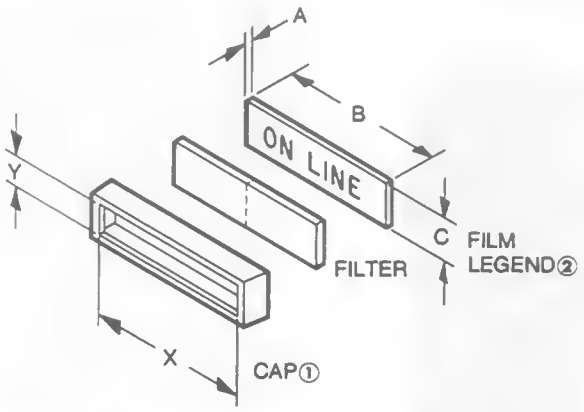
AML59 CAP ASSEMBLIES

The cap assembly consists of: black cap, color filter(s), and optional film legend; furnished unassembled. It snaps onto housing, flush with the housing bezel.

Filters, assembled with their matte finish facing the LED's, efficiently diffuse the illumination. They are color-tinted to complement the red, yellow, and green LED's.

NOTE: Cap assembly should not be subjected to the temperature and chemical atmosphere associated with wave soldering. These parts should be installed after soldering and cleanup.

Catalog listings for AML59 cap assemblies are derived from the ordering guide below. The ordering guide for AML45 LED housings is on page 38.



CUSTOM LEGENDS

A 2:1 drawing in black ink is required for satisfactory reproduction of custom film legends. As an alternative, you may submit an office copy of a page from a typographic supplier catalog such as Chartpak, Letraset, and Zipatone. MICRO SWITCH can also furnish graphic legends from the "Henry Dreyfus Symbol Source Book." (Custom legends require a one-time start-up charge.)

① Viewing area inside cap: X = 1.04 min.; Y = .272 min.

② Customers ordering film legends from commercial photographic or typesetting sources should specify that the film be precision cut, per the following dimensions, to insure proper retention and alignment on the face of the annunciator: A = .007 max.; B = 1.1 ± .010; C = .300 ± .003.

STANDARD LEGENDS

AML59 Legend Sheet (see page 42) provides ordering information for negative and positive standard film legends in the type style (14-point Helvetica condensed bold) shown below. Use separate legend sheet for each AML59 catalog listing and attach it (them) to your purchase order.

ABCDEFGHIJKLMNOPQRST
UVWXYZ &?!():',.-/#% ½
$0123456789

Approx. .165"

AML59 ORDER GUIDE

AML59-R K 10 R

Cap Style	Cap Color	Legend Type	Filter Color: Full Screen	Filter Color: Split Screen	Filter Color: Split Screen
AML59-R Full Screen	**K** Black	**10** No Legend	**R** Red	**R** Red	**R** Red
AML59-S Split Screen		**20** Negative Film Legend	**Y** Yellow	**Y** Yellow	**Y** Yellow
		21 Positive Film Legend	**G** Green	**G** Green	**G** Green

Examples:

AML59-RK10R
Full screen style, black cap, no legend, and red filter.

AML59-SK20RY
Split screen style, black cap, negative film legend, red and yellow color filters.

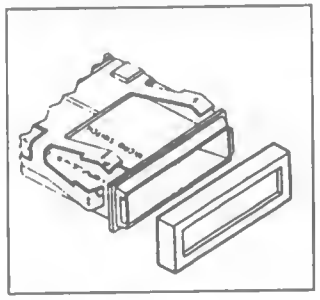
Honeywell

AML59 Legend Sheet

Account NO _____

Use this form to describe film legends to be used with AML59 Series Cover Assemblies

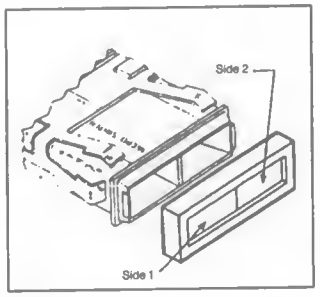
Catalog Listing 2 AML59 –		Quantity Ordered 3
P.O. No. 3	S. O. No	Line No
Schedule No.	Customer Part No.	Customer Dwg. No.



4 [ ][ ][ ][ ][ ][ ][ ][ ][ ]

Style "R" (Full Screen)

Special Direction _____



4 [ ][ ][ ][ ] | [ ][ ][ ][ ]

Side 1 Side 2

Style "S" (Split Screen)

Special Direction _____

Customer: _____

Address: _____
(city) (state)

INSTRUCTIONS:

1. Please use black ink to fill in shaded areas.
2. Fill in appropriate catalog listing. - One listing per sheet.
3. Fill in quantity ordered and your order no.
4. Indicate legends desired - do not exceed 9 characters for style "R" or 4 characters on either side of style "S".
5. This completed form must accompany your purchase order

NOTES:

- Legends must be designed to properly assemble to housings, which are to be installed with the MICRO SWITCH logo "up".
- All legends will be centered unless special directions are given.
- Standard legends are 14 pt. helvetica, condensed - Bold. A thru Z and numerals 0 thru 9 are standard.
- Legend Type: - Type "20" NEGATIVE - Type "21" POSITIVE

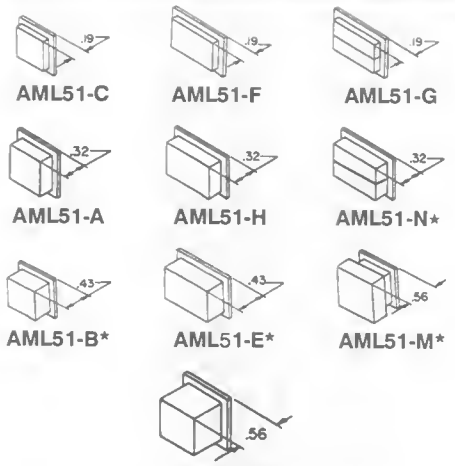
Manual Switches

Buttons/Lens for Switches and Indicators

AML51 PUSHBUTTON ORDER GUIDE (All possible color combinations may not be available.)
For Incandescent or non-lighted display switches and pushbutton style indicators.

AML51-C **10** **R** **—**

For AML11, 21, 31 switches and AML41 indicators: Pushbutton Style



For AML41D indicators only:

*Available with transmitted color (10 or 20) only.
****Insert is clear for projected color when "W" is used.

Display Legend/Type

Transmitted Color
10 No legend
20 With legend on cap.

Transmitted Color (Clear cap and color insert)
11 No legend
21 With legend on insert

Dead Front (Smoky gray cap and color insert)
30 No legend
40 With legend on insert

****Projected Color (White cap and color insert)
50 No legend
60 With legend on cap

Full Color or 1st Color Split

R Red
Y Yellow
G Green
B Blue
W** White
K*** Black
L*** Gray
A** Amber

2nd Color Split

R Red
Y Yellow
G Green
B Blue
W** White
K*** Black
L*** Gray
A** Amber

Example: **AML51-C10R**
Square full color button; with transmitted color, no legend; red.

**Available with transmitted color and dead front only.
***Black and gray not recommended for lighted display.
†AML51-N buttons not available with Display/Legend Types 10 and 20.
Note: Dimensions include the .060 in bezel.

AML51 LENS ORDER GUIDE (All possible color combinations may not be available.)
For incandescent display AML41J, K, and L lens style indicators only.

AML51-J **10** **R**

Lens style

Display/Legend Type

Transmitted Color
10 No legend
20 With legend

Transmitted Color (Clear cap and color insert)
11 No legend
21 With legend

Dead Front (Smoky gray cap and color insert)
30 No legend
40 With legend

****Projected Color (White cap and color insert)
50 No legend
60 With legend

Full Color or 1st Color Split	2nd Color Split	3rd Color Split
R Red	**R** Red	**R** Red
Y Yellow	**Y** Yellow	**Y** Yellow
G Green	**G** Green	**G** Green
B Blue	**B** Blue	**B** Blue
W** White	**W**** White	**W**** White
A** Amber	**A**** Amber	**A**** Amber

**Not available with projected color.
****Insert is clear for projected color when "W" is used.

AML51 lens buttons provide added display area by snapping onto and covering the bezel of AML41J, K, and L indicators. They do not fit other indicators or switches.

Example: **AML51-J10R**
Rectangular lens type button; full color; transmitted color, no legend; red.

HOW TO ORDER BUTTON LEGENDS

When specifying legended buttons, submit a legend order sheet to cover each listing. To insure proper legend orientation, AML housings (when viewed from the panel front) should have the "MICRO SWITCH" identification facing UP on square devices and UP or to the LEFT on rectangular.

Button legend order sheets are shown on the following pages. Reproduce them on your office copier.

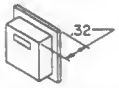
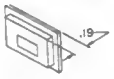
Legend Sheet	Form No.
AML51 Pushbuttons	FO-63394
AML51 Lens buttons	FO-63395
AML52 Pushbuttons	FO-63504
AML53 Paddle switch covers	FO-63567
AML55 Paddle switch covers	FO-63565
AML54 Rockers	FO-63566
AML56 Rockers	FO-63564

Manual Switches

Buttons for Switches and Indicators

AML52 BUTTON ORDER GUIDE (All possible color combinations may not be available.)
For AML12, AML22 (w/o light pipe), AML32, AML42 LED display.

AML52-N **10** **R**

Button Type	Display/Legend Type	Button Color
For LED Devices **AML52-C** **AML52-A***  **For AML32 Neon Devices** **AML52-N** 	**Transmitted Color** **10** No Legend **20** With Legend	**R** Red **Y** Yellow **G** Green **B** Blue **W** White **K** Black **A** Amber **L** Gray

Examples:

AML52-N10R
Rectangular full screen; for use on neon power switch with transmitted color, no legend; red button.

AML52-C10K
Square full screen; for use with LED device; transmitted color, no legend; black button.

Manuals

Honeywell

AML 52/57 Pushbutton Legend Sheet/Product Specification for L.E.D. & Neon Button

Page____of_____

Account No _____

Catalog Listing AML52 –		
Customer P.O. No.	Customer Dwg. No.	
MICRO SWITCH Sales Order	Line Number	Schedule No.

Customer: _____

Address: _____

_____ (city) (state)

LEGEND ORDER GUIDE

Button: Type Orientation	Figure NO	Max Lines 5/64	7/64	9/64	13/64	5/16	Max Characters 5/64	7/64	9/64	13/64	5/16
C	1	3	2	1	1	1	7	5	5	3	1
C	2	3	2	1	1	1	7	5	5	3	1
N	3	1	1	0	0	0	12	10	0	0	0
N	4	1	1	0	0	0	12	10	0	0	0
A	5	3	2	1	1	1	7	5	4	3	1
A	6	3	2	1	1	1	7	5	4	3	1

Instructions

1. Fill in appropriate catalog listing - one listing/sheet.
2. Check proper figure #. Type size, type color.
3. Fill in quantity required.
4. Indicate legends desired — Do not exceed maximums shown in legend order guide.

Note

1. For Proper Legend Orientation, AML housings (when viewed from front of panel) should have "MICRO SWITCH" logo oriented "UP" on square devices and "UP" or to the"LEFT" on rectangular devices.
2. Please use black ink in filling out this form to help us process your order.

Standard Legend Placement

1. Transmitted Color — Legend on outer shell (Button)
2. Figures 3 and 4 not applicable for AML57 listings

Modified Gothic lettering (A thru Z). numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, 13/64 and 5/16.

A3
Modified Gothic

.	,	:	;	!	?	'	_	"	/	(	)	*	&
$	¢	#	%	°	+	-	±	÷	x	=	≠	>	<
→	↑	↓	←	CR	1/4	1/2	3/4	1/3	2/3	@	∞		

LEGEND ORDER CHART

Customer Part NO	Fig NO	Type Size 5/64	7/64	9/64	13/64	5/16	Ink Color Black	White	Button Qty	Legend Description Sequence: Left-to-Right or Top-to-Bottom 1st Line	2nd Line	3rd Line

SPECIAL LEGENDS

NOTE: Use this area to show special Legend Locations or Configuretions NOT shown above. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A" | Fig. "B"

Sheet Prepared By: _____ (Signature) _____ (Date)

FO-63504-D

Honeywell

AML Pushbutton Legend Sheet/Product Specification

Page____of_____

Account NO 126 - 284

LEGEND ORDER GUIDE

Button: Type Orientation	Figure NO	Max Lines/Area 5/64	7/64	9/64	13/64	5/16		Max Characters/Line 5/64	7/64	9/64	13/64	5/16
AREA 1 A*B P,R	1	4/*3	3/*2	3/*2	2/*1	1/*1	Button Filter	7/*5	5/*4	5/*3	3/*2	1/*1
AREA 1 C	2	4/3	3/2	3/2	2/1	1/1		7/5	5/4	5/3	3/2	1/1
AREA 1 2 D	3	1/1	1/1	1/1	0/0	0/0		7/5	5/4	5/3	0/0	0/0
AREA 1 E,H*	4	4/*3	3/*2	3/*2	2/*1	1/*1		11/*10	9/*8	8/*7	5/*5	3/*3
AREA 1 E,H*	5	6/*6	4/*4	4/*4	3/*3	2/*2		7/*5	5/*4	5/*3	3/*2	1/*1
AREA 1 F	6	4/3	3/2	3/2	2/1	1/1		11/10	9/8	8/7	5/5	3/3
AREA 1 F	7	6/6	4/4	4/4	3/3	2/2		7/5	5/4	5/3	3/2	1/1
AREA 1 2 G,N	8	1/1	1/1	1/1	0/0	0/0		11/10	9/8	8/7	0/0	0/0
AREA 1 M	9	5/0	4/0	3/0	2/0	1/0		8/0	6/0	6/0	3/0	1/0

Definitions of Markings

Thru holes to snap into indicator housings

Internal reliefs to snap over switch plunger tabs

Standard Legend Placement –
Use special legends sec. for other placements

1. Transmitted Color — Legend on outer shell (Button)
2. Dead Front - Legend on Insert
3. Projected Color - Legend on outer shell (Button)
4. Transmitted color with clear cap legend on insert

Catalog Listing AML51 –		
Customer P.O. No.	Customer Dwg. No.	
MICRO SWITCH Sales Order	Line Number	Schedule No.

Customer: _____

Address: _____
(city) (state)

Instructions

1. Fill in appropriate catalog listing - one listing/sheet.
2. Check proper figure #. Type size, Type color.
3. Fill in quantity required.
4. Indicate legends desired — Do not exceed maximums shown in legend order guide.

Note

1. For Proper Legend Orientation, AML housings (when viewed from front of panel) should have "MICRO SWITCH" logo oriented "UP" on square devices and "UP" or to the"LEFT" on rectangular devices.
2. Please use black ink in filling out this form to help us process your order.
3. * INSERT ONLY ON STYLE A & H BUTTON

Modified Gothic lettering (A thru Z). numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, 13/64 and 5/16.

A3
Modified Gothic

STANDARD SYMBOLS AVAILABLE

.	,	:	;	!	?	'	_	"	/	(	)	*	&	
$	¢	#	%	°	+	-	±	÷	x	=	≠	>	<	
→	↑	↓	←	©R	1/4	1/2	3/4	1/3	2/3	@	∞			

SPECIAL LEGENDS

NOTE: Use this area to show special Legend Locations or Configurations NOT shown to the left. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A" | Fig. "B"

LEGEND ORDER CHART

Customer Part No	Fig No	Type Size 5/64	7/64	9/64	13/64	5/16	Ink Color Black	White	Button Qty	AREA	1st Line	2nd Line	3rd Line	4th Line	5th Line	6th Line
										1						
										2						
										1						
										2						
										1						
										2						
										1						
										2						
										1						
										2						

Sheet prepared by:

_____
(Signature)

_____
(Date)

FO-63394-K

Honeywell

AML Lens Legend Sheet/Product Specification

Page ____ of _____

Account No _____

LEGEND ORDER GUIDE

Button: Type Orientation	Figure No	Max Lines 5/64	7/64	9/64	13/64	5/16	Button Filter	Max Characters 5/64	7/64	9/64	13/64	5/16
AREA [1] J	1	4/4	3/3	3/3	2/2	1/1		14/13	11/10	10/9	7/6	3/3
AREA [1 2] K	2	4/4	3/3	3/3	2/2	1/1		6/5	6/5	6/5	3/3	1/1
AREA [1 2 3] L	3	4/4	3/3	3/3	2/2	1/1		4/3	3/3	3/3	2/1	1/1
AREA [1] J	4	4/4	3/3	3/3	3/3	2/2		9/8	7/6	7/6	4/3	2/2
AREA [1 / 2] K	5	3/3	2/2	2/2	1/1	1/1		8/7	7/6	7/6	4/3	2/2
AREA [1 / 2 / 3] L	6	2/2	1/1	1/1	1/1	0/0		8/7	7/6	7/6	4/3	0/0

Standard Legend Placement

1. Transmitted Color — Legend on outer shell (Button)
2. Dead Front - Legend on Insert
3. Projected Color - Legend on outer shell (Button)

Catalog Listing AML51 –		
Customer P.O. No.	Customer Dwg. No.	
MICRO SWITCH Sales Order	Line Number	Schedule No.

Customer: _____

Address: _____
(city) (state)

Instructions

1. Fill in appropriate catalog listing - one listing/sheet.
2. Check proper figure #. Type size, type color.
3. Fill in quantity required.
4. Indicate legends desired — Do not exceed maximums shown in legend order guide.

Note

1. For Proper Legend Orientation, AML housings (when viewed from front of panel) should have "MICRO SWITCH" logo oriented "UP" on square devices and "UP" or to the"LEFT" on rectangular devices.
2. Please use black ink in filling out this form to help us process your order.

LEGEND ORDER CHART

Customer Part No	Fig No	Type Size 5/64	7/64	9/64	13/64	5/16	Ink Color Black	White	Button Qty	AREA	Legend Description Sequence: Left-to-Right or Top-to-Bottom 1st Line	2nd Line	3rd Line	4th Line
										1				
										2				
										3				
										1				
										2				
										3				
										1				
										2				
										3				
										1				
										2				
										3				

Modified Gothic lettering (A thru Z). numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, 13/64 and 5/16.

A3
Modified Gothic

.	,	:	;	!	?	'	_	"	/	(	)	*	&
$	¢	#	%	°	+	-	±	+	x	=	≠	>	<
→	↑	↓	←	CR	1/4	1/2	3/4	1/3	2/3	@	∞		

SPECIAL LEGENDS

NOTE: Use this area to show special Legend Locations or Configurations NOT shown above. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A" | Fig. "B"

FO-63395-E

Sheet Prepared By: _____ (Signature) _____ (Date)

Manual Switches

Covers for Paddle Switches

Colored covers simply snap into the top of paddle switch housings.

COLOR DISPLAY OPTIONS

Transmitted color — Color is displayed whether lamp is On or Off. Choice of 1-piece covers (types 10 or 20) or covers with clear cap and colored translucent insert (types 11 or 12).

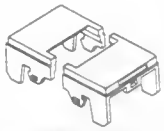
Dead front hidden color/hidden legend — Cover appears black with lamp Off. Legend and color appear when illuminated (types 30 or 40).

Projected color — Translucent white cover with transparent colored insert (types 50 or 60). White cover appears colored when illuminated.

AML53 PADDLE SWITCH COVER ORDER GUIDE (All possible color combinations may not be available.)

For AML13, AML23, and AML33 incandescent or non-lighted display.

AML53-T **10** **R** **G**

Paddle Switch Cover Type	Display/Legend Type	Cover Color: ½ cover, or one side of two-piece cover	Cover Color: Other side of two-piece cover (see note)
AML53-E ½ Cover	**Transmitted Color**	**R** Red	**R** Red
	10 No legend	**Y** Yellow	**Y** Yellow
	20 With legend on cap	**G** Green	**G** Green
	Transmitted Color (Clear cap and color insert)	**B** Blue	**B** Blue
	11 No legend	***W White	***W White
	21 With legend on insert	**K*** Black	**K*** Black
 **AML53-T** Two-Piece Cover	**Dead Front** (Smoky gray cap and color insert)	**L*** Gray	**L*** Gray
	30 No legend	**A**** Amber	**A**** Amber
	40 With legend on insert		
	***Projected Color (White cap and color insert)		
	50 No legend		
	60 With legend on cap		

Note: Only one color code letter is necessary when ordering ½ covers.

Example: **AML53-T10RG**
Two-piece cover; with transmitted color, no legend; red and green.

*Not for lighted display.
**Not available with projected color.
***Insert is clear for projected color when "W" is used.

AML55 PADDLE SWITCH COVER ORDER GUIDE (All possible color combinations may not be available.)

For AML35 neon display.

AML55-N **10** **R** **Y**

Paddle Switch Cover Type	Display/Legend Type	Lens Color	Cover Color
AML55-N Full Neon Cover, with colored lens	**Transmitted Color**	**T** Clear	**R** Red
	10 No Legend	**R** Red	**Y** Yellow
	20 With Legend		**G** Green
			B Blue
			W White
			K Black
			L Gray

AML55-N covers have a colored lenticular lens window which extends over the neon lamp.

Example: **AML55-N10RY**
Full neon paddle switch cover; with transmitted color, no legend; red lens and yellow cover.

Manuals

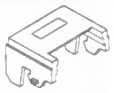
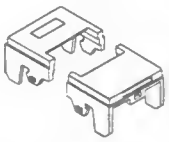
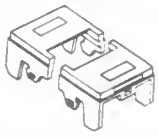
Manual Switches
Covers for Paddle Switches

AML55 PADDLE SWITCH COVER ORDER GUIDE (All possible color combinations may not be available.)

For AML15 and AML25 LED display.

See notes below

AML55-T **10** **Y** **R**

Paddle Switch Cover Type	Display/Legend Type	Cover Color – See notes below: 1/2-cover, or LED side of two-piece covers*	Cover Color – See notes below: Other side of two piece covers
AML55-E  1/2 Cover (For one LED)* AML55-T  Two-Piece Cover (For one LED) **AML55-H**  Two-Piece Cover (For two LED's)	**Transmitted Color** 10 No Legend 20 With Legend	**R** Red **Y** Yellow **G** Green **B** Blue **W** White **K** Black **L** Gray	**R** Red **Y** Yellow **G** Green **B** Blue **W** White **K** Black **L** Gray

AML55-E, -T, and -H covers have an open window which allows LED's to be flush with the cover surface.

* Notes:

[1] Only one color code letter is necessary for AML55-E 1/2 covers.

[2] To order a 1/2-cover without the LED "window," specify an AML53-E listing from the previous page.

Example: **AML55-T10YR**
Two-piece cover; with LED window in one side, transmitted color, no legend; yellow (LED side) and red (non-LED side).

HOW TO ORDER LEGENDS FOR PADDLE SWITCH COVERS

When specifying legended paddle switch covers, submit a legend order sheet to cover each catalog listing. These forms identify the maximum number of lines per area and the maximum characters per line, based on the type size you request.

To insure proper legend orientation, paddle switch housings (when viewed from the panel front) should have the "MICRO SWITCH" identification facing UP or to the LEFT.

Legend order sheets for covers are shown on the following pages. Reproduce them on your office copier or request a pad of them from the 800 number.:

Legend Sheet	Form No.
AML53 Covers	FO-63567
AML55 Covers	FO-63565

Honeywell

AML Paddle Operator (Cover) Legend Sheet/Product Specification

Page ____ of _____

Account NO 126 - 284

LEGEND ORDER GUIDE

Button: Type Orientation	Figure No	Max Lines/Area 5/64	7/64	9/64	13/64	5/16		Max Characters/Line 5/64	7/64	9/64	13/64	5/16
AREA 1 E	1	2/1	2/1	2/1	1/1	1/0	Button Filter	7/5	5/4	5/4	3/2	1/0
AREA 1 E	2	2/1	2/1	2/1	1/1	1/0		7/5	5/4	5/4	3/2	1/0
AREA 1 2 T	3	2/1	2/1	2/1	1/1	1/0		7/5	5/4	5/4	3/2	1/0

Standard Legend Placement – Use Special Legends Section for other placements.

1. Transmitted Color—Legend on outer shell (Button
2. Dead Front—Legend on insert
3. Projected Color - Legend on outer shell (Button)
4. Transmitted color with color with clear cap legend on insert.
5. All legends will be centered within the legendable areas.

Catalog Listing AML53 –		
Customer P.O. No.	Customer Dwg. No.	
MICRO SWITCH Sales Order	Line Number	Schedule No.

Customer: _____

Address: _____

(city) (state)

Instructions

1. Fill in appropriate catalog listing - one listing/sheet.
2. Check proper figure #. Type size, Type color.
3. Fill in quantity required.
4. Indicate legends desired — Do not exceed maximums shown in legend order guide.

Note

1. For Proper Legend Orientation, AML housings (when viewed from front of panel) should have "MICRO SWITCH" logo oriented "UP" on square devices and "UP" or to the"LEFT" on rectangular devices.
2. Please use black ink in filling out this form to help us process your order.

Modified Gothic lettering (A thru Z). numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, 13/64 and 5/16.

A3
Modified Gothic

STANDARD SYMBOLS AVAILABLE

.	,	:	;	!	?	'	_	"	/	(	)	*	&
$	¢	#	%	°	+	-	±	÷	x	=	≠	>	<
→	↑	↓	←	©R	1/4	1/2	3/4	1/3	2/3	@	∞		

LEGEND ORDER CHART

Customer Part No	Fig No	Type Size 5/64	7/64	9/64	13/64	5/16	Ink Color Black	White	Button Qty	Area 1 1st Line	Area 1 2nd Line	Area 2 1st Line	Area 2 2nd Line

Sequence: Left-to-Right or Top-to-Bottom

SPECIAL LEGENDS

NOTE: Use this area to show special Legend Locations or Configurations NOT shown above. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A" | Fig. "B"

FO-63567-F

_____ (Signature) _____ (Date)

Honeywell

AML Paddle (Cover) Legend Sheet For LED and Neon Style/Product Specification

Page____of _____

Account NO 126-284

Legend Order Guide

Cover Type Orientation	Figure No	Max Lines/Area 5/64	7/64	9/64	13/64	5/16		Max Characters/Line 5/64	7/64	9/64	13/64	5/16
E	1	1	1	1	0	0		7	5	5	0	0
E	2	1	1	1	0	0		7	5	5	0	0
Side 1 / Side 2 H	3	1/1	1/1	1/1	0/0	0/0	Side 1 / Side 2	7/7	5/5	5/5	0/0	0/0
Side 2 N	4	/2	/2	/2	/1	/1	Side 2 / Side 1	/7	/5	/5	/3	/1
Side 1 / Side 2 T	5	1/2	1/2	1/2	0/1	0/1	Side 1 / Side 2	7/7	5/5	5/5	0/3	0/1

Catalog Listing **AML55 –**

Customer P.O. No.	Customer Dwg. No.	Schedule No.
MICRO SWITCH Sales Order	Line Number	

Customer: _____

Address: _____

_____ (city) _____ (state)

Instructions

1. Fill in appropriate catalog listing - one listing/sheet.
2. Check proper figure #. Type size, Type color.
3. Fill in quantity required.
4. Indicate legends desired — Do not exceed maximums shown in legend order guide.

Note

1. For Proper Legend Orientation, AML housings (when viewed from front of panel) should have "MICRO SWITCH" logo oriented "UP" on square devices and "UP" or to the "LEFT" on rectangular devices.
2. Please use black ink in filling out this form to help us process your order.

Standard Legend Placement – Use Special Legends Section for other placements.

1. All Legends will be centered within the legendable areas

LEGEND ORDER CHART

Customer Part No	Fig No	Type Size 5/64	7/64	9/64	13/64	5/16	Ink Color Black	White	Button Qty	Area 1 1st Line	Area 1 2nd Line	Area 2 1st Line	Area 2 2nd Line

Sequence: Left-to-Right or Top-to-Bottom

FO-63565-C

_____ (Signature) _____ (Date)

SPECIAL LEGENDS

NOTE: Use this area to show special Legend Locations or Configurations NOT shown below. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A" | Fig. "B"

Modified Gothic lettering (A thru Z). numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, 13/64 and 5/16.

A3
Modified Gothic

STANDARD SYMBOLS AVAILABLE

.	,	:	;	!	?	'	_	"	/	(	)	*	&	
$	¢	#	%	°	+	-	±	÷	x	=	≠	>	<	
→	↑	↓	←	CR	1/4	1/2	3/4	1/3	2/3	@	∞			

COLOR DISPLAY OPTIONS

Rocker operators are assembled to the switches by simply snapping them into recesses in the switch operator sockets.

Transmitted color — Color is displayed whether lamp is On or Off. Choice of 1-piece rockers (types 10 or 20) or rockers with clear cap and colored translucent insert (types 11 or 12).

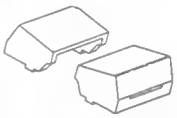
Dead front hidden color/hidden legend — Rocker appears black with lamp Off. Legend and color appear when illuminated (types 30 or 40).

Projected color — Translucent white rocker with transparent colored insert (types 50 or 60). White rocker appears colored when illuminated.

AML54 ROCKER OPERATOR ORDER GUIDE (All possible color combinations may not be available.)

For AML14, AML24, AML34 incandescent or non-lighted display.

AML54-F **10** **R**

Rocker Operator Type	Display/Legend Type	Rocker Color – See Note Below: Full rocker, 1/2 rocker, or one side of two-piece rockers	Rocker Color – See Note Below: Other side of two-piece rockers
AML54-F Full Rocker **AML54-E** 1/2 Rocker **AML54-T**  Two-Piece Rocker	**Transmitted Color** **10** No legend **20** With legend on cap **Transmitted Color** (Clear cap and color insert) † **11** No legend **21** With legend on insert **Dead Front †** (Smoky gray cap and color insert) **30** No legend **40** With legend on insert *****Projected Color †** (White cap and color insert) **50** No legend **60** With legend on cap	**R** Red **Y** Yellow **G** Green **B** Blue *****W** White **K*** Black **L*** Gray **A**** Amber	**R** Red **Y** Yellow **G** Green **B** Blue *****W** White **K*** Black **L*** Gray **A**** Amber

NOTE: AML54-F10 and AML54-F20 are one-piece, one-color full rockers. Thus only one color code letter is necessary when ordering. Include a two letter code for all other AML54-E (and AML54-T) catalog listings.

* Not for lighted display.
** Not available with projected color or dead front.
*** Insert is clear for projected color when "W" is used.
† Not available for use with AML34 power switches.

Example: **AML54-F10R**
Full rocker; with transmitted color, no legend; red.

AML56 ROCKER OPERATOR ORDER GUIDE

For AML36 neon display.

AML56-N **10** **R** **Y**

Rocker Operator Type	Display/Legend Type	Lens Color	Rocker Color
AML56-N Full Rocker with Colored Lens	**Transmitted Color** **10** No Legend **20** With Legend	**T** Clear **R** Red **Y** Yellow	**R** Red **Y** Yellow **G** Green **B** Blue **W** White **K** Black

AML56-N rockers have a colored lenticular lens window which extends over the neon lamp.

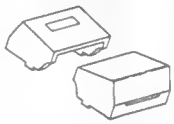
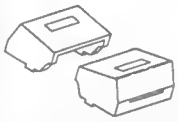
Example: **AML56-N10RY**
Full rocker; with transmitted color, no legend; yellow rocker and red lens.

Manuals

AML56 ORDER GUIDE

For AML16 and AML26 LED display.

AML56-T **10** **R** **B**

Rocker Operator Type	Display/Legend Type	Rocker Color – See Notes Below: 1/2-rocker or LED side of two-piece rockers	Rocker Color – See Notes Below: Other side of two piece rockers
AML56-E 1/2-Rocker* (For one LED)	**Transmitted Color** **10** No Legend **20** With Legend	**R** Red **Y** Yellow **G** Green **B** Blue **W** White **K** Black **L** Gray	**R** Red **Y** Yellow **G** Green **B** Blue **W** White **K** Black **L** Gray
AML56-T  Two-Piece Rocker (For one LED)			
AML56-H  Two-Piece Rocker (For two LED's)			

Example: **AML56-T10RB**
Two-piece rocker; with LED window in one side, transmitted color, no legend; red (LED side) and blue (non-LED side).

* Notes:

[1] Only one color code letter is necessary for AML56-E 1/2-rockers. AML56-E, -T, and -H rockers have an open window which allows LEDs to be flush with the rocker surface.

[2] To order a 1/2-rocker without the LED "window," specify an AML54-E listing from the previous page.

HOW TO ORDER ROCKER LEGENDS

When specifying legended rockers, submit a legend order sheet to cover each catalog listing. These forms identify the maximum number of lines per area and the maximum characters per line, based on the type size you request. To insure proper legend orientation, rocker switch housings (when viewed from the panel front) should have the "MICRO SWITCH" identification facing UP or to the LEFT.

Rocker legend order sheets are shown on the following pages. Reproduce them on your office copier.

Legend Sheet	Form No.
AML54 Rockers	FO-63566
AML56 Rockers	FO-63564

Honeywell

AML Rocker Legend Sheet/Product Specification

Page____ of_____

Account NO 126-284

Legend Order Guide

Button Type Orientation	Figure No	Max Lines/Area 5/64	7/64	9/64	13/64	5/16	Button Filler	Max Characters/Line 5/64	7/64	9/64	13/64	5/16
AREA 1 E	1	2/2	2/2	2/1	1/1	1/0		7/5	5/4	5/4	3/2	1/0
AREA 1 E	2	2/2	2/2	2/1	1/1	1/0		7/5	5/4	5/4	3/2	1/0
AREA 1 2 F	3	2/2	2/2	2/1	1/1	1/0		7/5	5/4	5/4	3/2	1/0
AREA 1 2 T	4	2/2	2/2	2/1	1/1	1/0		7/5	5/4	5/4	3/2	1/0

Catalog Listing
AML54 –

Customer P.O. No. | Customer Dwg. No.

MICRO SWITCH Sales Order | Line Number | Schedule No.

Customer: _____

Address: _____

(city) (state)

Instructions

1. Fill in appropriate catalog listing - one listing/sheet.
2. Check proper figure #. Type size, Type color.
3. Fill in quantity required.
4. Indicate legends desired — Do not exceed maximums shown in legend order guide.

Note

1. For Proper Legend Orientation, AML housings (when viewed from front of panel) should have "MICRO SWITCH" logo oriented "UP" on square devices and "UP" or to the"LEFT" on rectangular devices.
2. Please use black ink in filling out this form to help us process your order.

Standard Legend Placement – Use Special Legends Section for other placements.
*NOT AVAILABLE WITH AML 34 SERIES

1. Transmitted Color—Legend on outer shell (Button
*2. Dead Front—Legend on insert
*3. Projected Color - Legend on outer shell (Button)
*4. Transmitted color with clear cap legend on insert.
5. All legends will be centered within the legendable areas.

SPECIAL LEGENDS

NOTE: Use this area to show special Legend Locations or Configurations NOT shown below. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A" Fig. "B"

LEGEND ORDER CHART

Customer Part No	Fig No	Type Size 5/64	7/64	9/64	13/64	5/16	Ink Color Black	White	Button Qty	Area 1 1st Line	Area 1 2nd Line	Area 2 1st Line	Area 2 2nd Line

Sequence: Left-to-Right or Top-to-Bottom

Modified Gothic lettering (A thru Z). numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, 13/64 and 5/16.

A3
Modified Gothic

STANDARD SYMBOLS AVAILABLE

.	,	:	;	!	?	'	_	"	/	(	)	*	&
$	¢	#	%	°	+	-	±	+	x	=	≠	>	<
→	↑	↓	←	CR	1/4	1/2	3/4	1/3	2/3	@	∞		

FO-63566-F

(Signature) (Date)

Honeywell

AML Rocker Legend Sheet/Product Specification

Page____of_____

Account NO 126-284

Legend Order Guide

Button Type Orientation	Figure No	Max Lines/Area 5/64	7/64	9/64	13/64	5/16		Max Characters/Line 5/64	7/64	9/64	13/64	5/16
AREA 1 E	1	1	1	1	0	0		7	5	5	3	0
AREA 1 E	2	1	1	1	0	0		7	5	5	3	0
AREA 1 / AREA 2 H	3	1 / 1	1 / 1	1 / 1	0 / 0	0 / 0	AREA 1 / AREA 2	7 / 7	5 / 5	5 / 5	3 / 3	0 / 0
AREA 2 N	4	2	2	2	1	1	AREA 2	7	5	5	3	1
AREA 1 / AREA 2 T	5	1 / 2	1 / 2	1 / 2	1 / 1	0 / 1	AREA 1 / AREA 2	7 / 7	5 / 5	5 / 5	3 / 3	0 / 1

Standard Legend Placement – 1. All legends will be centered within the legendable areas.
Use Special Legends Section for other placements.

Catalog Listing
AML56 –

Customer P.O. No.		Customer Dwg. No.
MICRO SWITCH Sales Order	Line Number	Schedule No.

Customer: _____

Address: _____

(city) (state)

Instructions

1. Fill in appropriate catalog listing - one listing/sheet.
2. Check proper figure #. Type size, Type color.
3. Fill in quantity required.
4. Indicate legends desired — Do not exceed maximums shown in legend order guide.

Note

1. For Proper Legend Orientation, AML housings (when viewed from front of panel) should have "MICRO SWITCH" logo oriented "UP" on square devices and "UP" or to the"LEFT" on rectangular devices.
2. Please use black ink in filling out this form to help us process your order.

SPECIAL LEGENDS

NOTE: Use this area to show special Legend Locations or Configurations NOT shown below. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A" Fig. "B"

LEGEND ORDER CHART

Customer Part No	Fig No	Type Size 5/64	7/64	9/64	13/64	5/16	Ink Color Black	White	Button Qty	Area 1 1st Line	Area 1 2nd Line	Area 2 1st Line	Area 2 2nd Line

Sequence: Left-to-Right or Top-to-Bottom

FO-88564-E

(Signature) (Date)

Modified Gothic lettering (A thru Z). numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, 13/64 and 5/16.

A3
Modified Gothic

STANDARD SYMBOLS AVAILABLE

.	,	:	;	!	?	'	_	"	/	(	)	*	&
$	¢	#	%	°	+	-	±	÷	x	=	≠	>	<
→	↑	↓	←	CR	1/4	1/2	3/4	1/3	2/3	@	∞		

Manual Switches
Mounting Hardware

FOR STRIP AND MATRIX MOUNT ASSEMBLIES

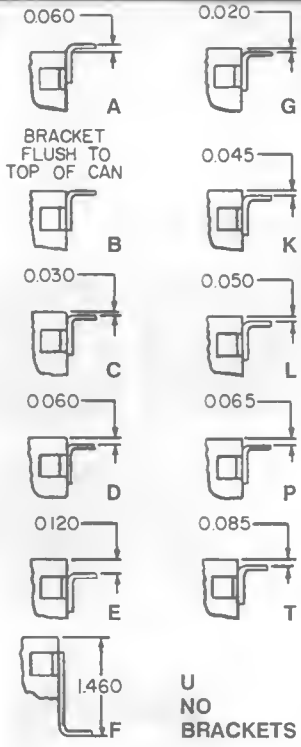
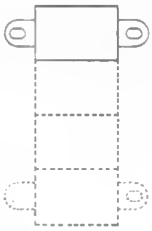
FEATURES

- Enables subpanel mounting of devices in factory assembled metal cans which are welded together in strips or matrices. Assures accurate alignment and enables pre-wiring.
- L-shaped mounting brackets conform to various panel thicknesses, using spacers.
- Simplifies panel fabrication, since only one large cutout is required.
- Facilitates printed circuit board mounting. Operating force is transmitted to mounting hardware, rather than P.C. board.
- For custom matrices contact the MICRO SWITCH Application Center.
- Mounting dimensions page 64.

AML61 MOUNTING HARDWARE ORDER GUIDE

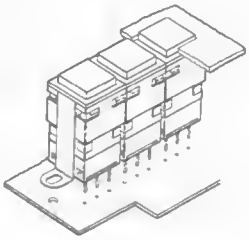
(For standard strip mount assemblies)

AML61 B — **A** — **5** — **A**

Type	Mounting Bracket Orientation	Number of Cans	Mounting Bracket Location
Square cans: **AML61 B** (Plain finish) **AML61 J** (Black finish)	A E 	1 2 3 4 5 6 7 8 9* 10* 11* 12* *A, C, D & E orientation only.	
Rect. cans: **AML61 E** (Plain finish) **AML61 K** (Black finish)	B C D ① 		

① To order one rectangular can with mounting brackets on short sides, specify AML61EB1____ or AML61KB1____.

Example: **AML61EC5A**
Five rectangular cans, plain finish (unpainted), long sides abutting; type **A** mounting brackets on long sides, located flush with switch or indicator bezel. (Type **T** bracket brings top of annunciator bezel flush with top of .160 in./4,1 mm panel.)



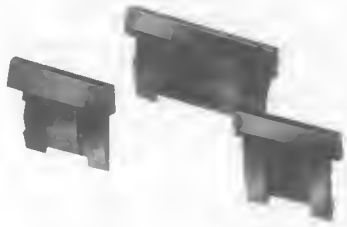
This strip has Type F brackets for P.C. board mounting.

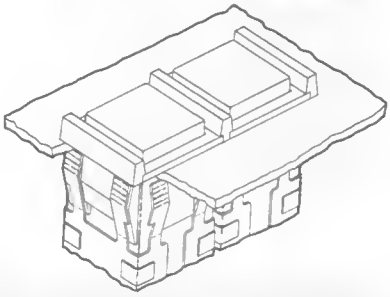
NON-STANDARD ASSEMBLIES

Use the order form on the following page to specify non-standard AML61 strip or matrix assemblies. You may reproduce it on your office copier, or order pads from the 800 number. Request FO-63558.

Manuals

AML71 BARRIERS





Drawing shows two switches, slot mounted. From left to right: one center barrier, a second switch, plus another end barrier to complete the arrangement.

When mounting an individual unit, an end barrier is attached to each side of the housing. The center barrier is used in a slot mount array.

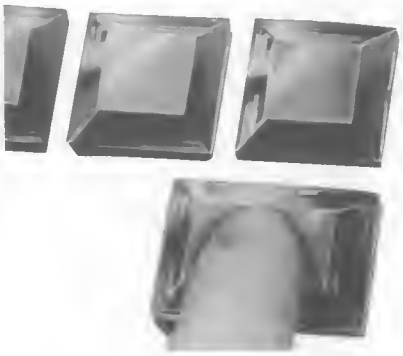
FEATURES
- Barriers separate individually mounted switches and indicators — help prevent inadvertent actuation of two pushbutton switches with a single push.
- Front of panel mounting simplifies installation.

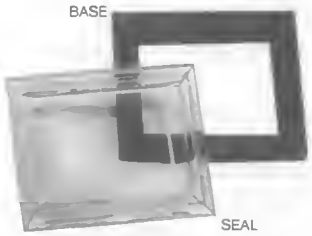
AML71 BARRIER ORDER GUIDE (See notes)
Barriers shown in order guide are black.

Barrier Length	Type	Catalog Listing
Short (For use with square devices and short side of rectangular devices.)	Center	AML71SCB
	End	AML71SEB
Long (For use with long side of rectangular devices.)	Center	AML71LCB
	End	AML71LEB

Notes:
Not for use with AML61 mounting hardware or any full guard bezel products.
Not for use with AML41J, K, or L lens type indicators; or AML45 annunciators.

AML75 PANEL SEAL





MATERIAL
Base: Polypropylene
Cap: Polyvinyl Chloride

FEATURES
- AML75 panel seals fit pushbutton switches and indicators.
- Provides protection from contamination from accidental beverage spills, dust, and dirt.
- Easy to install, without tools
- No effect on display color, light intensity, or legend quality.
- Replace seal or change lamps without removing switch from panel.
- For .19-inch standard height square or rectangular pushbuttons.
- Mounting dimensions page 65.

The design complements AML's functional appearance, creating a pleasing framed effect around the button. It consists of a matte black plastic base which press-fits between the panel and switch bezel, and a transparent flexible seal which snaps into the base. PK 8521, shipped with each order, provides installation instructions.

Button colors and legends can be viewed without distortion whether lighted or unlighted. Seals can be conveniently replaced or removed for relamping, without removing the switch from panel.

Operating temperature range is 32° to 131°F (0° to 55°C).

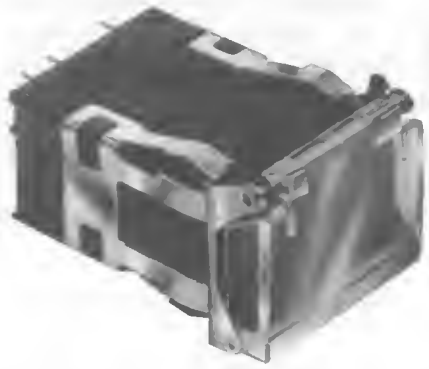
AML75 PANEL SEAL ORDER GUIDE

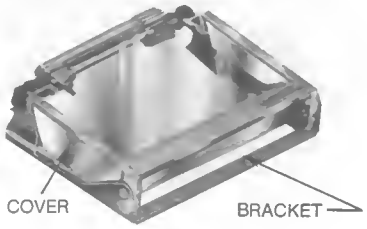
Description	For Use With: Square .19" high pushbuttons	Rectangular .19" high pushbuttons	Rockers
Base & Seal	AML75ABC	AML75BBC	AML75RBC
Base Only	AML75ABN	AML75BBN	—
Seal Only	AML75ANC	AML75BNC	—

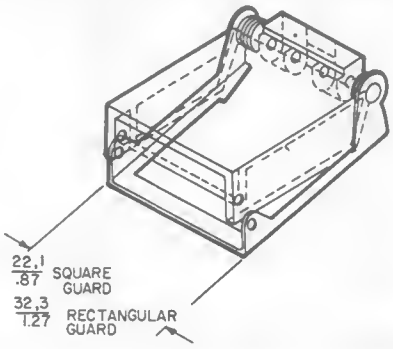
Notes:
Multiple units should not be mounted in a single slot, since this would create an unsealed space between each unit. AML75 seals are not for use with barriers, full guard bezels, AML61 mounting hardware, AML45 annunciators, or AML41J, K, or L lens type indicators.

Manual Switches

Switch Guard/Panel Plugs, Dummy Housings







FEATURES

- Button cannot be operated when switch guard cover is closed, preventing accidental operation
- Wire lock-down feature further prevents unintentional actuation of the switch.
- Lamps can be replaced with the switch guard attached, without special tools, saving maintenance time
- Can be used with alternate or momentary action square or rectangular .19 inch standard height AML buttons
- Shock resistant construction, for long, maintenance-free life

AML76 switch guard protects square and rectangular .19-inch standard height pushbuttons from inadvertent actuation. It is for use with standard bezel type switches only.

See page 65 for mounting dimensions.

The switch guard cover is clear, polycarbonate thermoplastic through which the button is easily visible. The word "lift" is molded onto the top front edge of the guard. The bracket is bright-finished stainless steel.

The switch guard may be assembled to the AML pushbutton before the switch is installed in a panel. Or, the guard can be assembled to a pushbutton already mounted in a panel, providing the wiring is sufficiently slack to raise the switch bezel above the panel; and if there is sufficient clearance with adjacent units. PK 8522 contains installation instructions and is shipped with each order.

AML switch guards may be mounted in horizontal or vertical matrices. A wire lock-down feature, using .020-inch diameter locking wire, may be used as an additional protection.

SWITCH GUARD ORDER GUIDE

Guard Type*	Catalog Listing
Square	AML76C10T01P
Rectangular	AML76F10T01P

* The word "LIFT" is molded into the cover. If other languages are desired contact the 800 number.

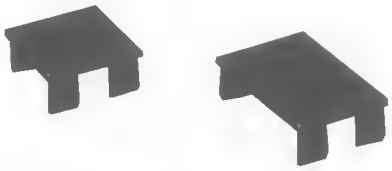
Note: Switch guard is not designed for use with AML61 mounting hardware, AML71 barriers, or full guard bezel switches.

CONNECTOR BLOCK

AML79CC

This connector block can be used with square 1 and 2 pole AML21 and AML22 switches with .110 × .020 terminals to enable plug-in wiring.

AML78 PANEL PLUGS



Plastic panel plugs (shown above) enable the user to provide for future needs by punching extra panel holes. Finished in matte black, they are the same height as the standard AML bezel when snapped in place from the panel front.

Panel plugs are only for use in individual holes or with AML61 mounting hardware in multi-station strips. (Use dummy housings in strip cutouts without AML61 mounting hardware.)

PANEL PLUG ORDER GUIDE

Plug Type	Catalog Listing
Square	AML78CB
Rectangular	AML78FB

AML78 DUMMY HOUSINGS

Dummy housings can be used to provide for expansion needs in strip cutouts without AML61 mounting hardware. They have mounting clips, but there is no provision for switching or illumination.

DUMMY HOUSING ORDER GUIDE

Dummy Housing Type*	Catalog Listing
Square (Pushbutton style)	AML78C100
Rectangular (Pushbutton style)	AML78F100
Rectangular (Lens indicator style)	AML78J100

* Order AML51 Buttons/lenses for use with dummy housings.

Manual Switches

Lamps, Soldering Recommendations, Receptacles

AML91 LAMP ORDER GUIDE

Lamp Type	Industry Lamp No.	Voltage	Catalog Listing
Incandescent T-1-3/4 wedge base	86	6.3	AML91LA86
	73	14.0	AML91LA73
	85	28.0	AML91LA85

LAMP DATA

The following data was compiled from manufacturer's specifications, for reference only.

INCANDESCENT LAMPS

Industry Lamp No.	Volts	Amps	Watts	MSCP	Life A/C Volts
86	6.3 5.5 5.0	.200 .185 .177	1.25 1.12 .89	.49 .246 .185	20,000 hours 106,200 hours 290,000 hours
73	14.0 12.0	.080 .077	1.12 1.00	.30 .23	15,000 hours 36,450 hours
85	28.0 24.0	.04 .037	1.12 .89	.30 .177	7,000 hours 41,860 hours

Neon Lamps

25,000 hours (half life)

INTEGRAL LEDs

LEDs Furnished Permanently Installed in These Products	V_f	I_f	V_{PD}	Peak Inverse Voltage	
				w/o Diode Protection	w/Diode Protection
AML12, 15, 16, 22, 25, 26, 42	2.4 V	20 mA	.7 V	5 V	34 V
AML45	2.4 V	20 mA	.7 V	4 V	33 V

100,000 hours (half life).

AML92 SERIES LEDs

For use with these AML switches and indicators equipped with lamp sockets:
Pushbutton switches: AML11 (Square Only)*, AML21 (rectangular and square), and AML31.
Paddle switches: AML31/23/33
Rocker switches: AML14/24/34
Indicators: AML41

* Rectangular solid state with one or two lamp circuits cannot be used with LED catalog listings ending in "L".

AML92 ORDER GUIDE

LED Color	Quad Chip	Six Chip
Red	AML92ERY	AML92ERL
Green	AML92EGY	AML92EGL
Yellow	AML92EYY	AML92EYL
White	—	AML92EWL**

** For use with white or yellow buttons.

OPERATING CHARACTERISTICS

Type	V_F Fwd. Voltage (typ.) Yellow	Green	Red	White	I_F Fwd. Current	V_R Rev. Voltage
Quad Chip	8.6	8.6	7.8	—	15 mA	16 V
Six Chip	4 V	4 V	4 V	4 V	50 mA	5.6 V

TEMPERATURE RANGE

(Quad Chip or Six Chip)
Operating: –20 to 60°C (–4 to 140°F)
Storage: –30 to 100°C (–22 to 212°F)

SOLDERING RECOMMENDATIONS

All terminals are solder plated. Proper soldering and cleaning procedures must be followed to maintain the reliability of AML products during installation. An instruction sheet which outlines these procedures is included with AML shipments. You may also obtain a copy from your MICRO SWITCH Sales Office. Request PK 8518.

As a general guide, the following information may be used:

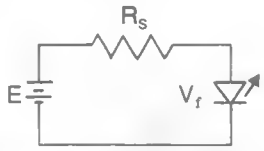
Use a 280°C (538°F) solder iron tip, up to 6 seconds duration, with a 60-40 rosin core solder. This allows the terminal to heat quickly on the exterior of the housing only, and greatly reduces the chance of flux migrating inside the housing.

LED APPLICATION INFORMATION

For those devices without internal current limiting resistors, suitable external control of the LED current must be provided. It is recommended that a minimum of 5 VDC open circuit voltage with an appropriate series resistance be used to drive LED devices. This minimizes the effect of temperature (current variation) on forward voltage of the LED.

Resistor values can be determined by supply voltage or current for LED:

$$R_S = \frac{E - V_f}{I_f}$$



WHERE: R_S = Series Resistance
E = Supply Voltage
V_f = Forward Voltage of LED
I_f = Circuit Current

If a diode is added in series for reverse polarity protection then:

$$R_S = \frac{E - V_f - V_{PD}}{I_f}$$

WHERE: V_{PD} Forward Voltage of Protection Diode

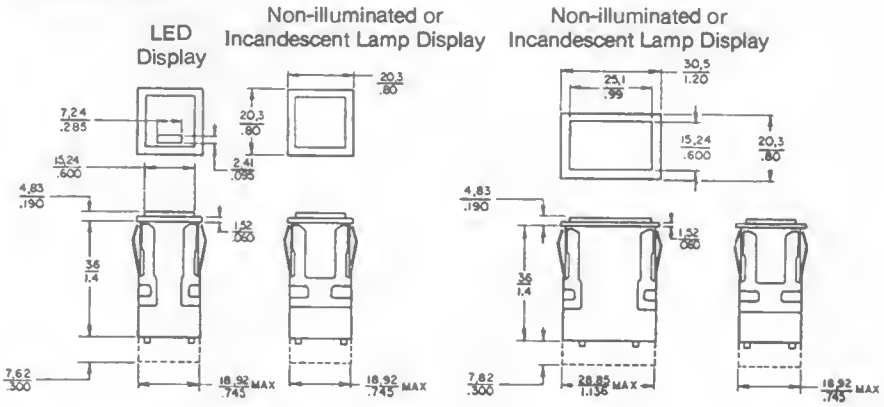
Manual Switches

Mounting Dimensions (For Reference Only)

AML11/12 and 21/22 SWITCHES
AML41C/D and AML42C INDICATORS

Note: Top of full guard bezel housing .19/5,0 from panel.

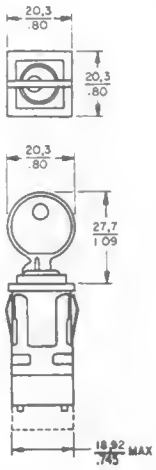
PUSHBUTTONS



For terminal locations, see page 61.

AML27 SWITCHES

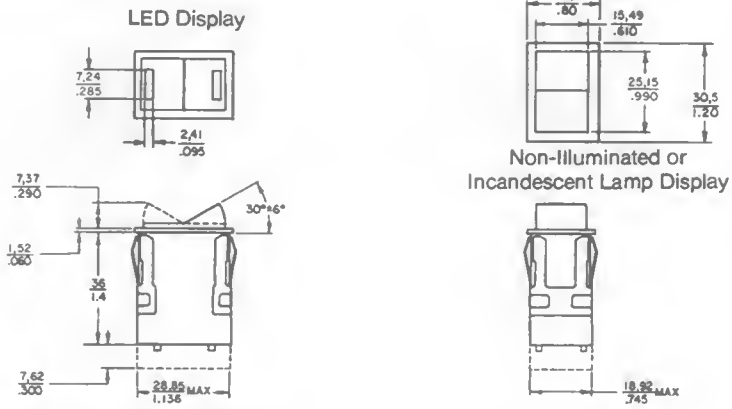
KEYLOCK



For terminal locations, see page 62.

AML14/16 and AML24/26 SWITCHES

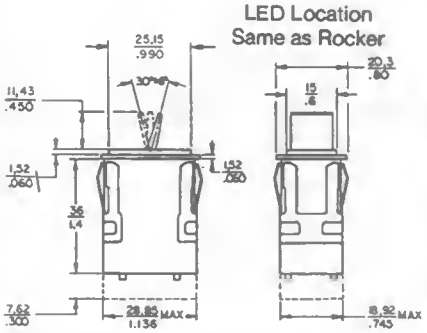
ROCKERS



For terminal locations, see page 61, 62.

AML13/15 and 23/25 SWITCHES

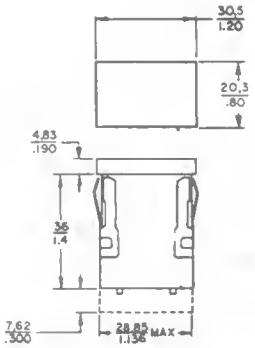
PADDLES



For terminal locations, see page 61, 62.

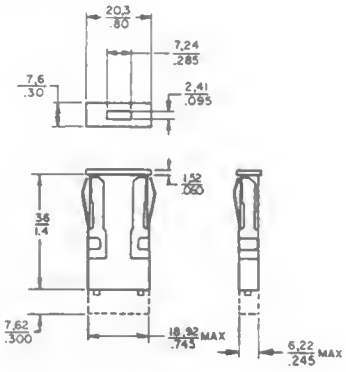
AML41 INDICATOR

LENS STYLE



AML42 INDICATOR

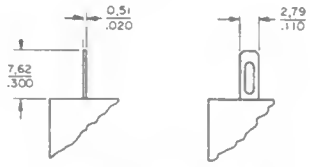
MINIATURE



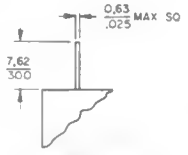
For terminal locations, see page 62.

NOTE
1 Dimensions are mm or mm/IN
IN

TERMINAL TYPES



Solder or Quick Connect



Printed Circuit

Solder Hole will accept two #22 AWG Stranded Conductor (per NEMA publication DC-2 1976)

Manuals

Manual Switches

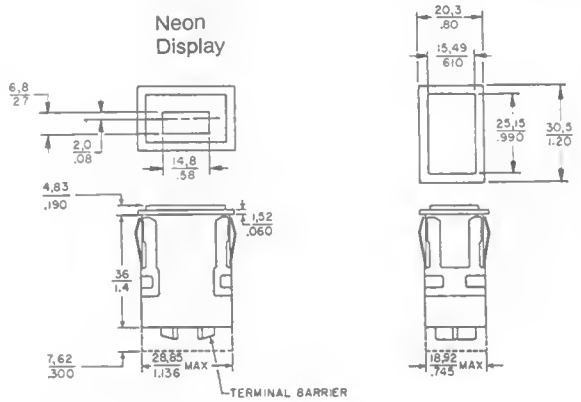
Mounting Dimensions (For Reference Only)

AML31/32 SWITCHES

PUSHBUTTON

Non-illuminated or Incandescent Lamp Display

Neon Display

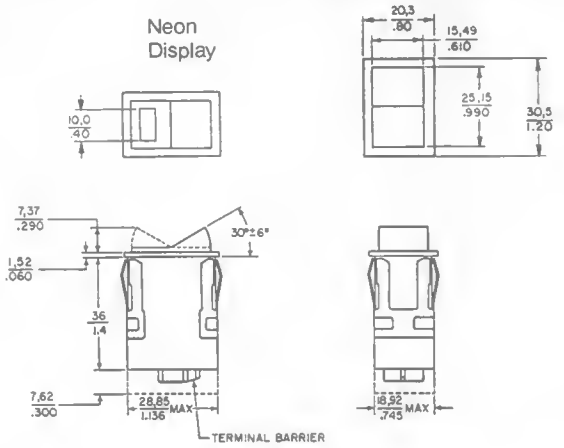


AML34/36 SWITCHES

ROCKER

Non-illuminated or Incandescent Lamp Display

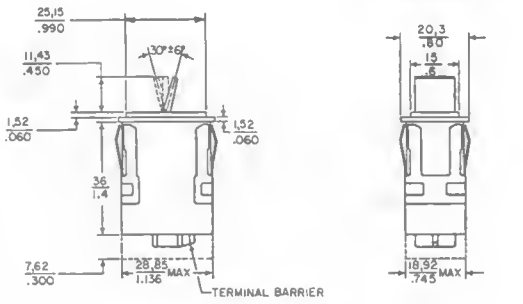
Neon Display



AML33/35 SWITCHES

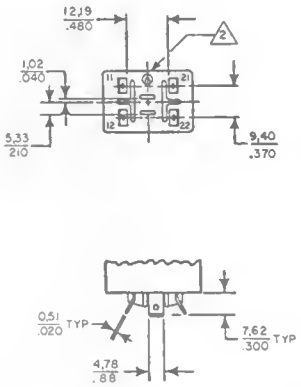
PADDLE

Neon Location Same as Rocker

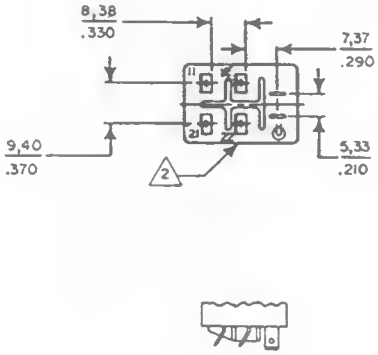


TERMINAL LOCATIONS

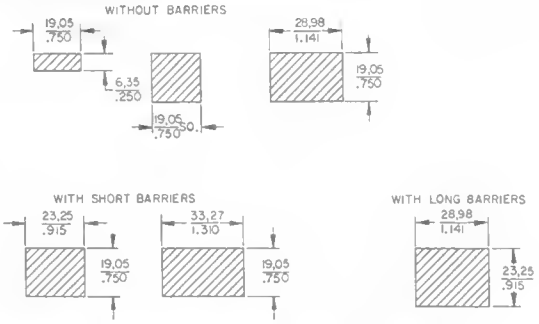
PUSHBUTTON



ROCKER AND PADDLE



PANEL CUTOUT FOR SINGLE-STATION FRONT-OF-PANEL MOUNTING



Recommended panel thickness: .060-.187/1,52-4,75

PANEL PUNCH FOR AML SERIES

A panel punch is manufactured by Greenlee-Textron Tool Co., Rockford, IL (815-926-3011).

NOTES

1 Dimensions are mm/IN or mm/IN

2 Manufacturers logo on this side of housing

Solder Hole Will Accept One #14 AWG Stranded Conductor (Per NEMA Publication DC-2 1976)

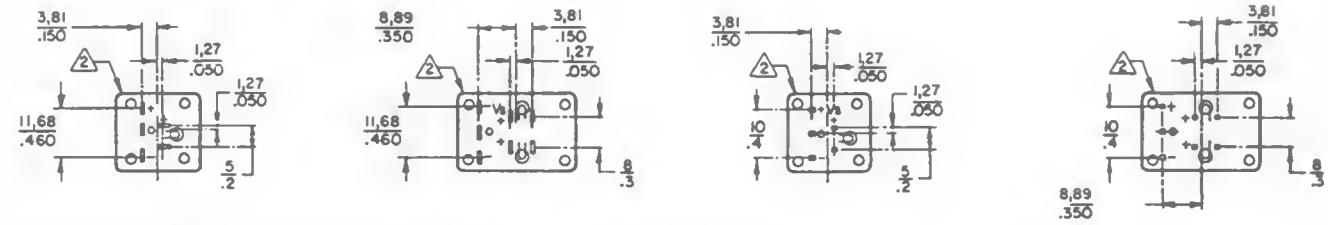
Manual Switches

Mounting Dimensions (For Reference Only)

TERMINAL LOCATIONS FOR AML10 SWITCHES

PUSHBUTTONS

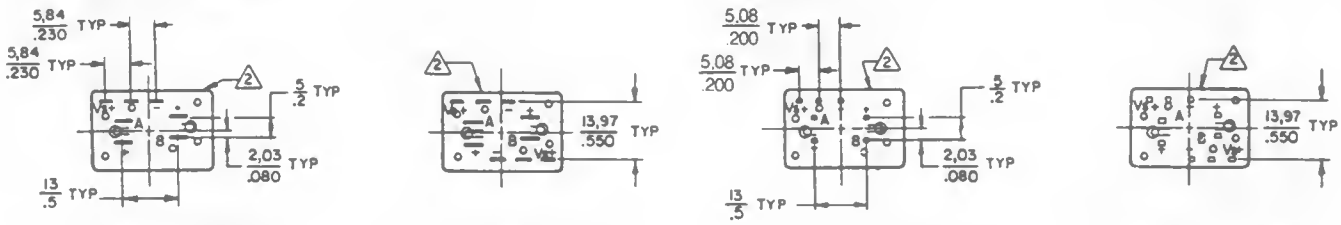
Solder and Quick-Connect **Printed Circuit**



Illuminated devices shown (non-illuminated devices do not have lamp terminals).

ROCKERS AND PADDLES

Solder and Quick-Connect **Printed Circuit**

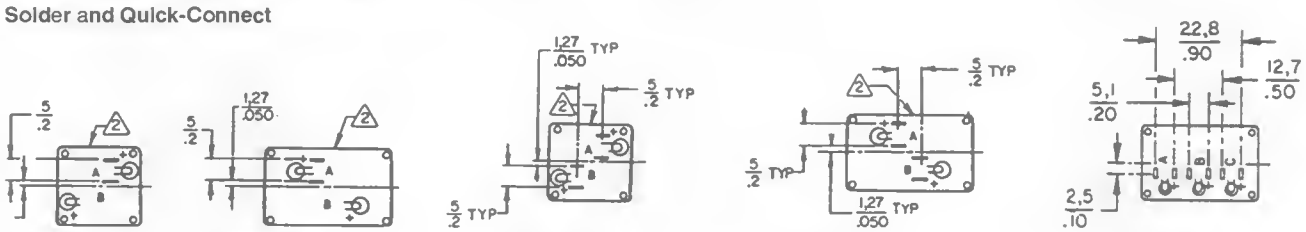


One Integrated Circuit | Two Integrated Circuits | One Integrated Circuit | Two Integrated Circuits

Illuminated devices shown (non-illuminated devices do not have lamp terminals)

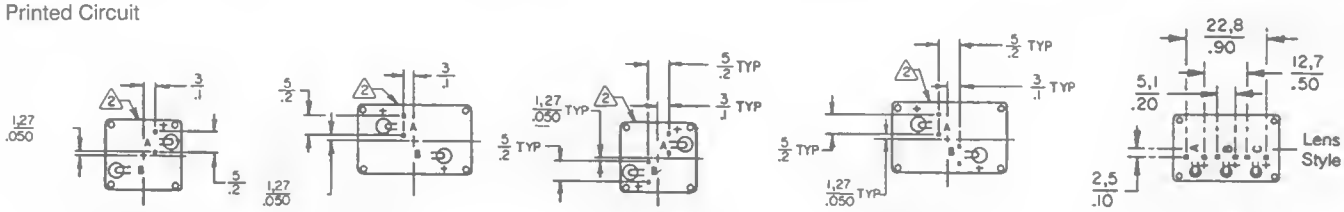
TERMINAL LOCATIONS FOR AML41 INDICATORS

Solder and Quick-Connect



1 Incandescent Lamp Circuit | 1 Incandescent Lamp Circuit | 2 Incandescent Lamp Circuits | 2 Incandescent Lamp Circuits | 1-3 Incandescent Lamp Circuits 6

Printed Circuit

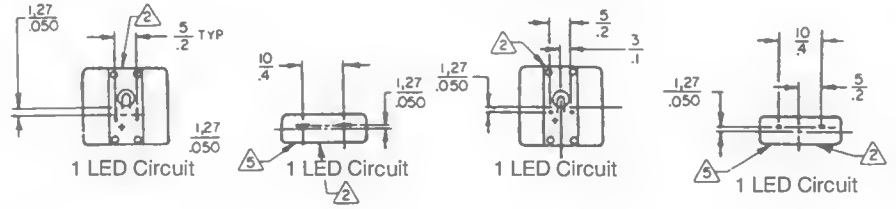


1 Incandescent Lamp Circuit | 1 Incandescent Lamp Circuit | 2 Incandescent Lamp circuits | 2 Incandescent Lamp Circuits | 1-3 Incandescent Lamp Circuits 6

Lens Style

TERMINAL LOCATIONS FOR AML42 INDICATORS

Solder and Quick-Connect **Printed Circuit**



1 LED Circuit | 1 LED Circuit | 1 LED Circuit | 1 LED Circuit

NOTE

1 Dimensions are MM/IN or MM/IN

2 Manufacturer's logo on this side of housing

4 – Lamp terminals are not provided for non-illuminated devices

5 positive terminal ident. (+) marked this side of housing

6 1 – lamp termination identified by "B".
2 – lamp termination identified by "A" and "C".

Manuals

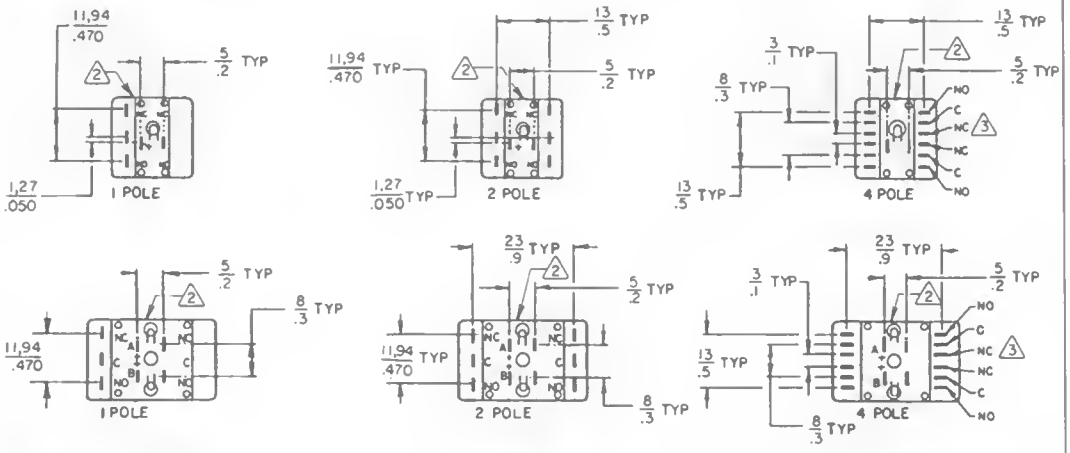
Manual Switches

Mounting Dimensions (For Reference Only)

TERMINAL LOCATIONS FOR AML20 SWITCHES

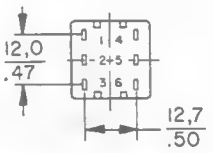
PUSHBUTTON SWITCHES
Solder or Quick-Connect

3 Terminal identification marked on each adjacent side of housing

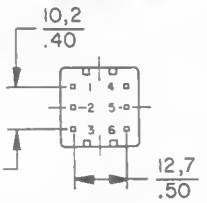


1 Pole 2 Pole 4 Pole

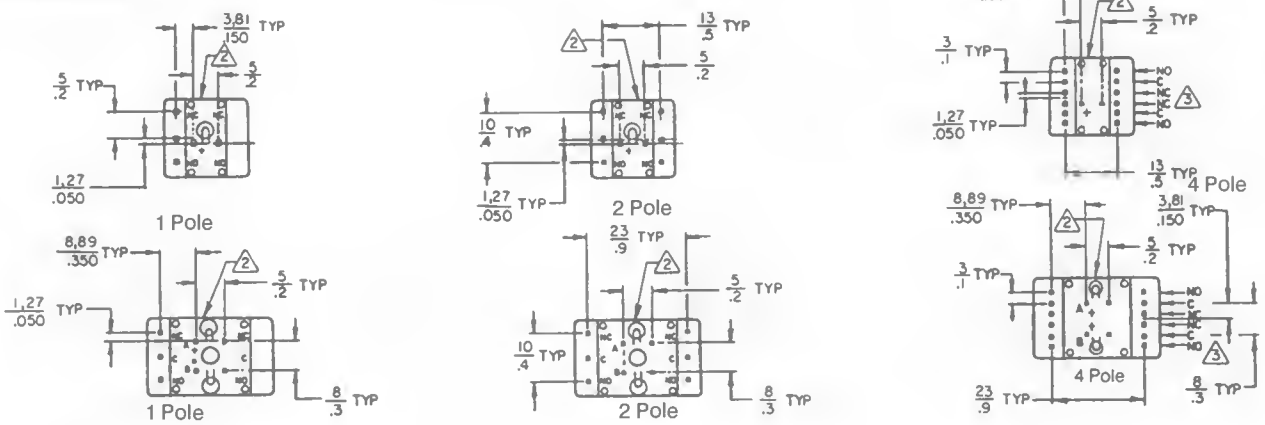
KEYLOCK SWITCHES
Solder or Quick-Connect



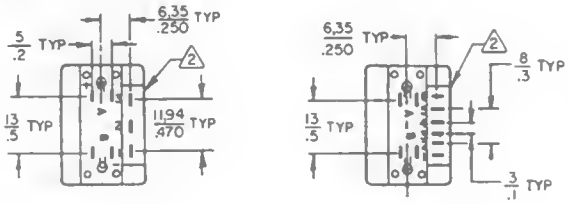
Printed Circuit



PUSHBUTTON SWITCHES
Printed Circuit

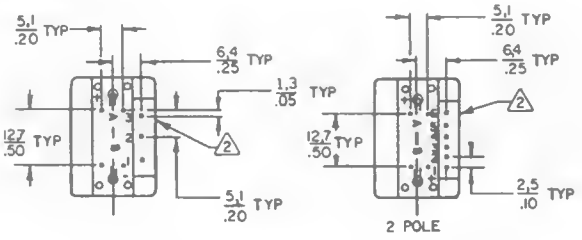


ILLUMINATED ROCKERS AND PADDLES
Solder or Quick-Connect



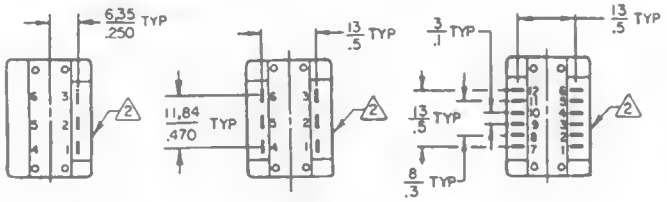
1 Pole 2 Pole

Printed Circuit



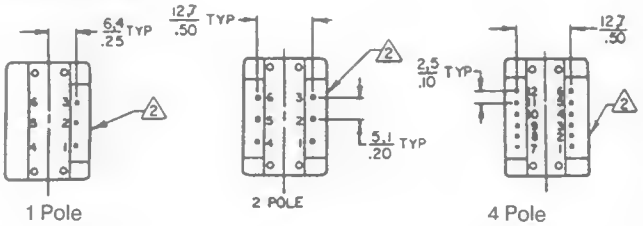
1 Pole 2 Pole

NON-ILLUMINATED ROCKERS AND PADDLES
Solder or Quick-Connect



1 Pole 2 Pole 4 Pole

Printed Circuit



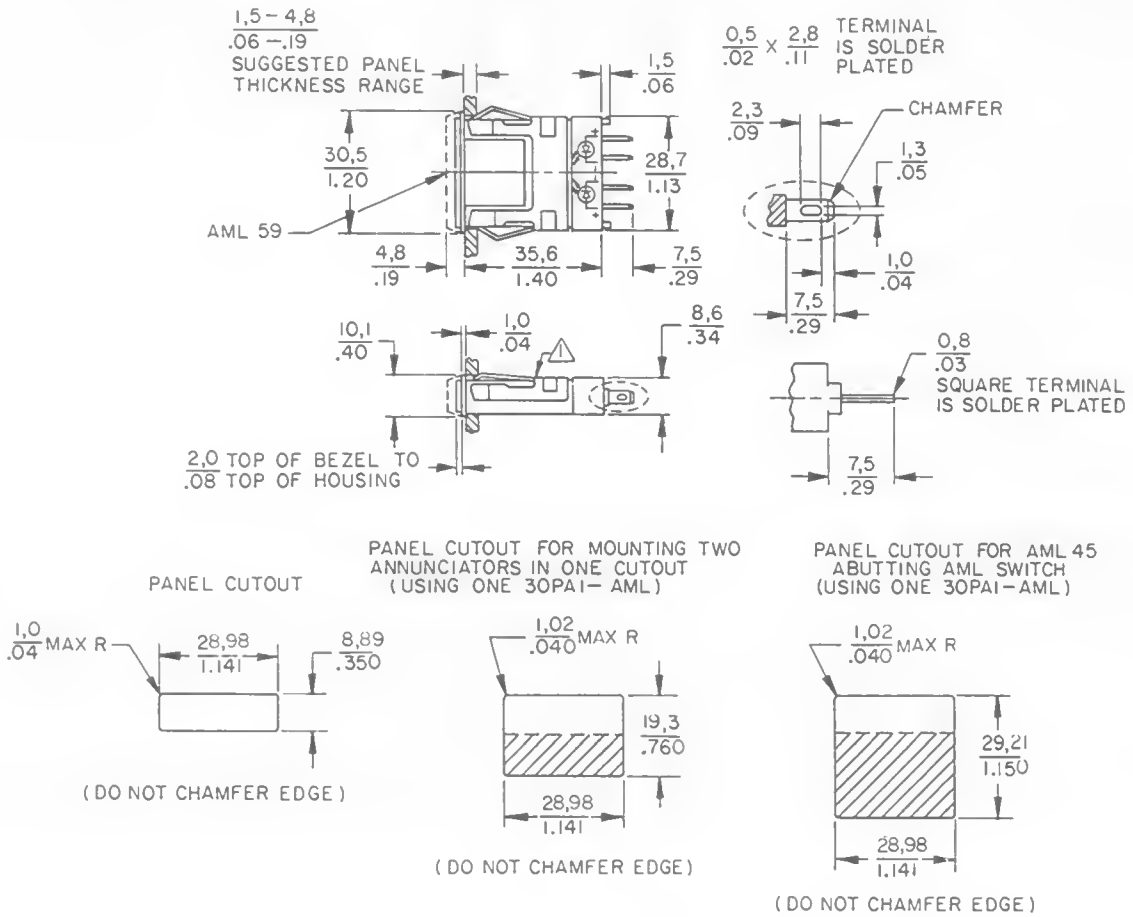
1 Pole 2 Pole 4 Pole

Manual Switches

Mounting Dimensions (For Reference Only)

ANNUNCIATORS

AML45 SERIES



⚠ Manufacturer's logo on this side of housing

For panel punch manufacturer, see page 60.

Manuals

Manual Switches

Mounting Dimensions (For Reference Only)

MULTI-STATION FRONT-PANEL MOUNTING

Panel cutouts (See page 61 for panel punch manufacturer.)

Square Switches & indicators	Rect. Switches & indicators	Annunciator
(.8) (No. of units) — .045* (20,3) (No. of units) — 1,14*	(1.20) (No. of units) — .045* (30,5) (No. of units) — 1,14*	(.40) (No. of units) — .045* (10,1) (No. of units) — 1,14*

For each barrier, add .053/1,35

* Note: If barriers are used, do not subtract .045 in./1,14 mm from the panel cutout formula. (.045 in./1,14mm is the allowance for the width of the bezel.)

AML61 MULTI-STATION SUBPANEL MOUNTING

Panel cutouts for AML61

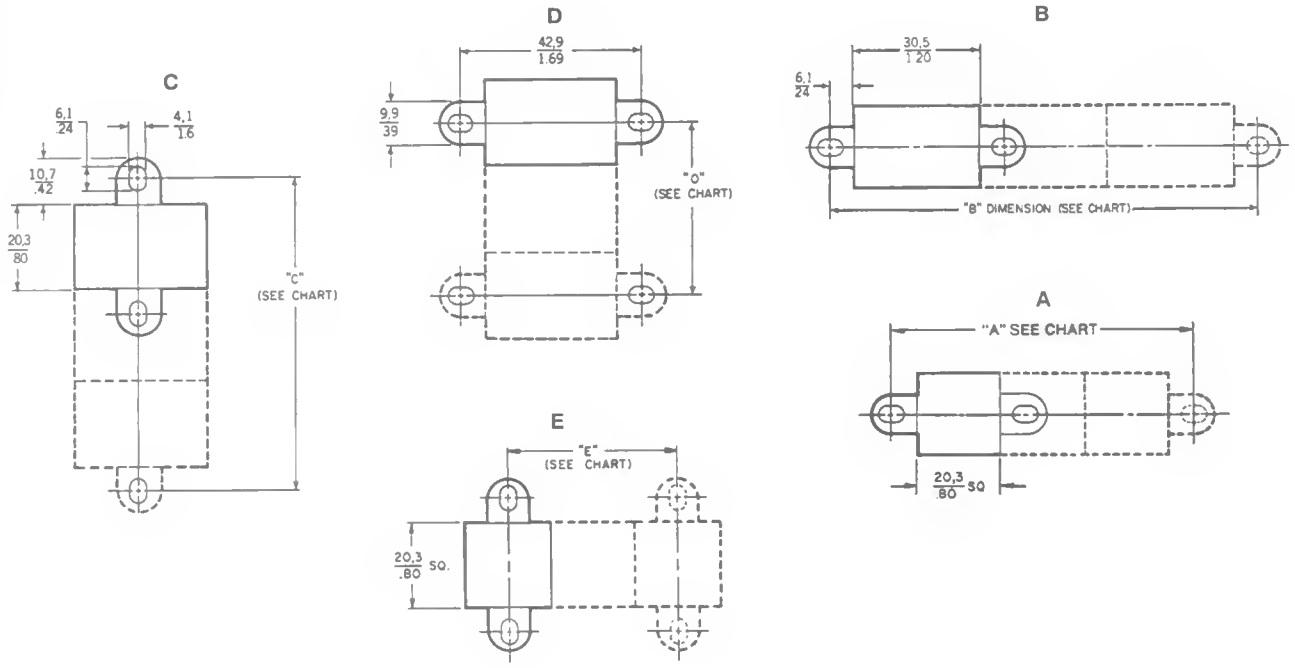
Mounting Bracket Orientation		Width	Length
A*	in. mm	.810 20,57	(.810)(No. of units)
B	in. mm	.810 20,57	(1.210)(No. of units)
C or D*	in. mm	1.210 27,94	(.810)(No. of units)

* More than two cans with mounting brackets required for strips of more than 10 units.

AML61 MOUNTING CENTERS

Mounting Bracket Orientation		Mounting Centers/Number of Cans											
		1	2	3	4	5	6	7	8	9	10	11	12
"A" or "C"	in. mm	1.285 32,64	2.095 53,21	2.905 73,79	3.715 94,36	4.525 114,94	5.335 135,51	6.145 156,08	6.955 176,66	7.765 197,23	8.575 217,81	9.385 238,38	10.195 258,95
"B"	in. mm	1.685 42,80	2.895 73,53	4.105 104,27	5.315 135,00	6.525 165,74	7.735 196,48	8.945 227,20	10.155 257,94				
"D" or "E"	in. mm	on C_L on C_L	.807 20,50	1.614 41,00	2.421 61,49	3.228 81,99	4.035 102,49	4.842 122,99	5.649 143,48	6.456 163,98	7.263 184,48	8.070 204,98	8.877 225,48

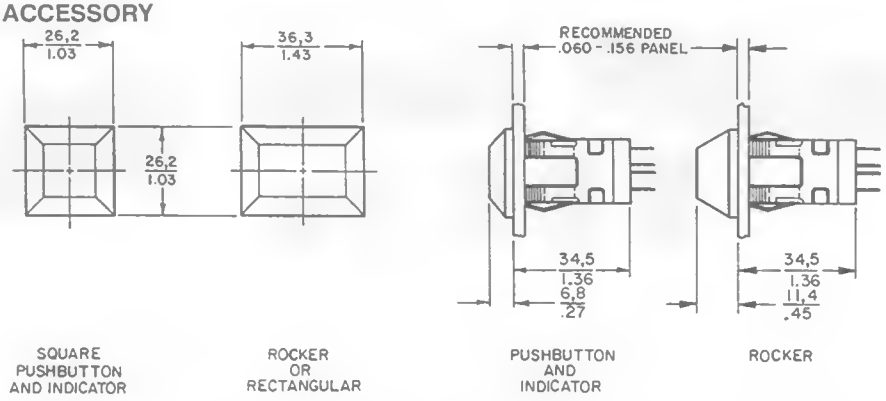
Tolerance = ±.015



Manual Switches

Mounting Dimensions (For Reference Only)

AML75 PANEL SEAL ACCESSORY

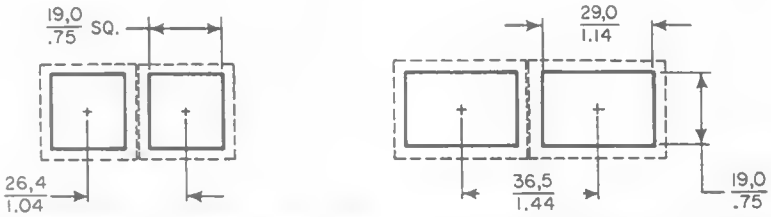


Panel cutouts

Multiple panel sealed units should not be mounted together in a single elongated slot, since this would create an unsealed space between each unit.

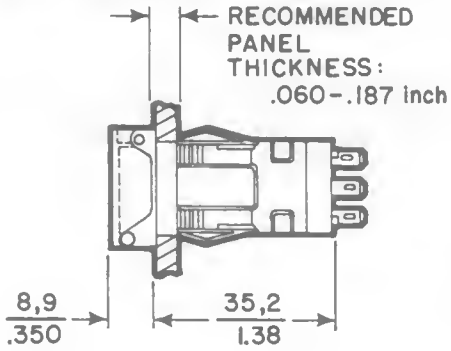
Side-by-side mounting can be achieved, per the center-to-center dimensions shown in the drawing. (Dotted lines indicate the seal bases which are abutting at front of panel.)

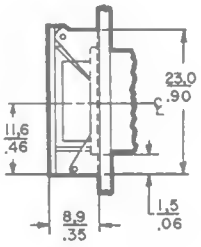
AML75 seals are not designed for use with the AML61 mounting system.

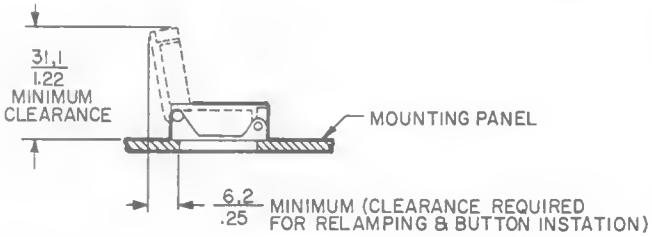


NOTE: Suggested cutout dimensions are based on an .125"/3,18 mm panel thickness. Individual preferences for inpanel fit may require measurement of assemblies before panels are cut.

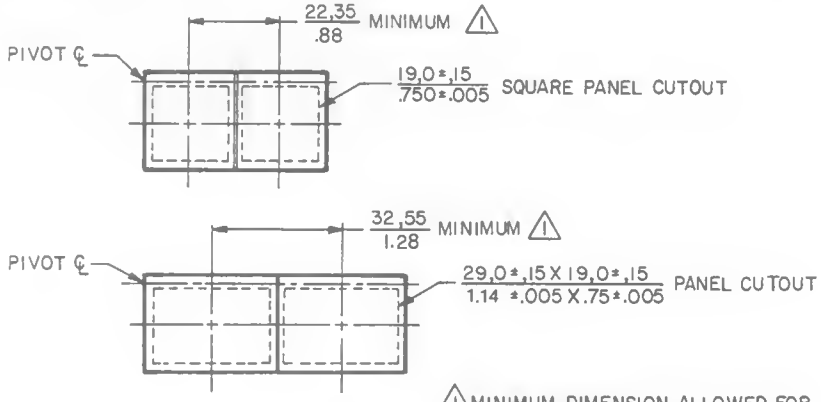
AML76 SWITCH GUARD ACCESSORY







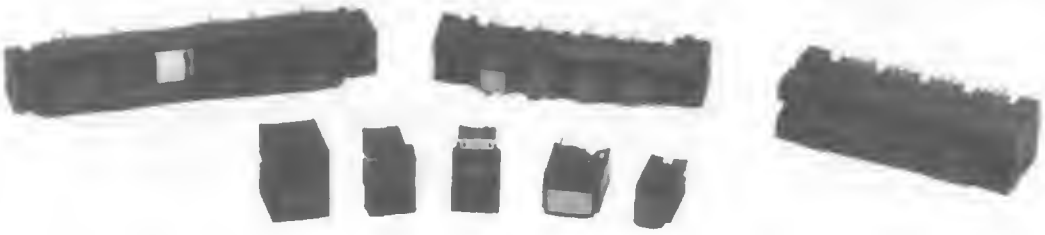
PANEL CUTOUTS



⚠ MINIMUM DIMENSION ALLOWED FOR MOUNTING GUARDS SIDE BY SIDE

Manuals

Manual Switches
Miniature Manual Line



FEATURES
- Breadth of line offers complete selection of pushbuttons, rockers, and indicators to accommodate different functions and promote operator efficiency.
- Printed wiring board (PWB) or panel mounted switches, plus multi-unit strip mounting, and single level termination for cost-effective installation.
- Tactile feedback imparts a definite feel of switching action.
- Coordinated appearance enhances panel harmony.
- Illumination by long-life LED's and incandescent lamps—for lighted display versatility.
- Solid state, electronic control and power duty switching—for electrical versatility.
- Temperature range: –18° to 65°C (0° to 149°F).

DESIGN FREEDOM
Rocker switches are available in the MICRO SWITCH MML Miniature Manual Line. They complement AML pushbuttons and indicators, providing you flexibility and design freedom to answer all your miniature manual control requirements. You can choose the actuator option that matches the switch function and natural habit pattern reflex of the operator. You no longer need to compromise quality, appearance, or human factors considerations, because of size constraints.

The MML pushbutton and indicator offering has also been expanded to include new square forms which are small enough to fit in the tightest places.

MOUNTING FLEXIBILITY
Printed wiring board (PWB) mounted switches can be arranged in individual panel openings or multi-unit strips, in a common panel cutout. Optional support brackets provide added rigidity for stand-alone PWB mounted devices. Units with bezels and mounting clips can be snap-in mounted from the panel front.

Single level PWB or solder/quick-connect termination throughout makes wiring faster, easier, and more economical. Housings are designed to accommodate washing, before and after wave soldering, to help prevent contamination during printed wiring board installation.

LIGHTED DISPLAY OPTIONS
Pushbuttons and indicators can be full-face illuminated by LED's or incandescent lamps for high visibility of colors and legends. Inherently rugged, long-life LED's reduce service and maintenance costs. Also, their low drive and inrush current (30 mA or less) reduces costs of drive circuitry.

Rockers can be furnished with colored lenses for illumination by LED's or incandescent lamps.

CONTROL VERSATILITY
Solid state pushbutton switches with Hall effect integrated circuits interface directly with microprocessors and other logic level devices. Time-proven for billions of cycles, Hall effect IC's provide the ultimate in reliability.

Electronic control pushbutton or rocker switches, with gold or silver contacts, handle up to 1 amp; power duty switches, up to 6 amps.

Manual Switches

Miniature Manual Line

MML ENHANCES PANEL HARMONY

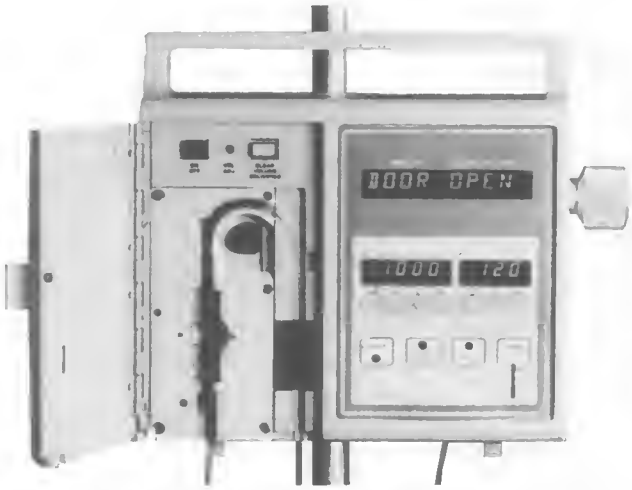
The attractive clean line design of the total MML offering is coordinated to work in harmony and enhance the visual qualities of your product. MML will help make a good first impression with your customers by blending with other panel components. And also work hard over the long run to maintain operator satisfaction.

HOW TO ORDER

To specify MML catalog listings, refer to the order guides. They are based on a modular cataloging system which gives you the flexibility to choose the combination of feature options that best answers the requirements of your application.

ORDER GUIDES

Solid State Switches
MML11 Pushbutton Switches 70
Electronic Control Switches
MML21 Pushbutton Switches 72
MML24 Rocker Switches 74
Power Duty Switches
MML31 Pushbutton Switches 76
Indicators
MML41 Indicators/LED or Incandescent Display 78
MML46 Indicators/LED or Incandescent Display 78
Lenses and Buttons
MML51 Lenses/Incandescent or Non-lighted Display 80
MML52 Lenses/LED or Neon Display 80
Mounting Hardware
MML61 Strip Mounting Frames 83
MML72/73 Bezels and Mounting Clips 84
MML74 PWB Mount Support Brackets 84
LED's, Lamps, Receptacles
MML92/93 LED's/Receptacles 85/88
MML91/93 Incandescent Lamps/Receptacles 87/88



MML medical application. Intranvaneous fluid flow controller automatically dispenses fluids for medications, therapy, and nutrition.

MML communications application. Mobile radio control keeps businesses in touch with employees on the road.

Manuals

MML CHARACTERISTICS

	MML 10 Series	MML 20 Series	MML 30 Series	MML 40 Series
Mechanical Lifetime*				N/A
Pushbuttons–Momentary	1,000,000	250,000	100,000	---
Pushbuttons–Alternate	100,000	100,000	100,000	---
Rockers	100,000	250,000	100,000	---
Electrical Lifetime* **				N/A
Pushbuttons–Momentary	1,000,000	25,000	25,000	---
Pushbuttons–Alternate	100,000	25,000	25,000	---
Rockers	100,000	25,000	25,000	---
Agency Ratings				
UL	File E53576	File E12252	File E12252	File E58932
CSA	File L R4442	File LR4442	File LR4442	File LR4442

*95% Survival
**Lifetime at Full Rated Load

MML ELECTRICAL DATA
MML10 SERIES

Electrical Characteristics	Integrated Circuit Function	5-24 VDC Sinking
	Supply Current (Max.)	7 mA (Released) 8 mA (Operated no load)
	Output Voltage (Operated)	0.3 Volt (Sinking 10 mA)
	Output Leakage Current Max. (Released)	5.0 μA
	Switching Time Max. Rise 10% to 90% Fall 90% to 10%	 1.5 μ sec (Sinking 10 mA) 0.5 μ sec (Sinking 10 mA)
	Rated Output Current	10 mA Sinking
Absolute Maximum Ratings	Supply Voltage (V_s)	–28 to +28 VDC
	Voltage Externally Applied to Output	–0.5 Volt min. +28 Volts max. (Off condition)
	Loads to Output	20 mA (Sinking)
	Storage Temperature	–40° to +85°C (–40° to +185°F)
	Operating Temperature	–18° to +65°C (0° to +149°F) and supply voltage of 4.5 to 5.5 VDC

As with all solid state components, performance can be expected to deteriorate as rating limits are approached; however, they will not be damaged unless the limits are exceeded.

Manual Switches

Miniature Manual Line

MML20 SERIES

Electrical Rating (silver contacts)	**Standard buttons** Up to 1 amp, 125 VAC
	1 piece plunger/lens cap buttons: Black—Up to 1 amp, 125 VAC All others—Up to 0.5 amp, 125 VAC
Electrical Rating Gold Contacts	**All button styles:** Up to 0.25 amp, 30 VDC UL rating—0.10 amp, 30 VDC
	One pole Form C

MML30 SERIES

MML31:

Electrical Rating Silver Contacts	6A @ 125 VAC, 250 VAC; 2A @ 30 VDC; 1A @ 125 VDC "L"; 1/10 hp @ 125 VAC
Contact Arrangement	1 or 2 poles Form X

Manuals

LED, INCANDESCENT, OR NON-LIGHTED DISPLAY

PWB Mount

FEATURES

- Hall effect reliability
- Provides low voltage signals that interface with nearly all DC logic
- Accepts one LED or incandescent lamp
- Printed wiring board mounting
- UL recognized, CSA certified
- Bezels and mounting clips, LEDs and legended lenses can be furnished installed or ordered separately

Example: MML11KK3AAKRSDR
Furnished with black bezel; mounting clips (long sides); red LED, and red lens installed.

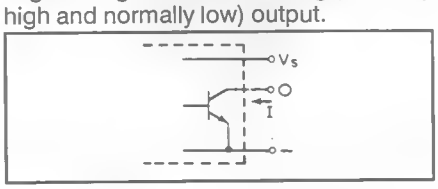
MML11 ORDER GUIDE

Catalog listing codes for switch, less assembled display options

MML11K	A	3	AA
Housing Type (Rectangular)	**Mounting**	**Terminals**	**Circuitry/Action**
MML11K Black housing	**K** Black bezel, mtg. clip/long sides	**3** Printed wiring board	**AA** 5-24 VDC sinking mom. action

Electrical Data	page 69
Strip and matrix mounting	page 83
Mounting dimensions	page 91
PWB pin locations	page 91
LED/receptacle	pages 85/86
Lamp/LED/Lens	pages 87/88

Current Sinking Output
A permanent magnet plunger moves adjacent to the Hall effect integrated circuit to give a digital, current sinking (normally high and normally low) output.



Order display options assembled to switch by adding codes below

K

er
ack

RS

LED
(Stanley Type)

XX	No LED
RS	Red*
YS	Yellow*
GS	Green*

* Permanently installed.

DR

Lens

For LED display:

DR	Red
DY	Yellow
DG	Green

For incandescent or non-lighted display:

LR	Red
LY	Yellow
LG	Green
LW	White
LK	Black

Leave this space blank.

Legend

20 With Legend

Use Legend Order Sheet FO-74024 to cover each catalog listing (see page 81).

CUSTOMER INSTALLATION:

LED
1. Order LED and receptacle, page 85.
2. Installation instructions, page 86/88.

Incandescent Lamp
1. Order lamp/PWB receptacle or lamp/solder receptacle, page 87.
2. Installation instructions, page 88.

Manual Switches
Electronic Control Pushbutton

LED, INCANDESCENT, OR NON-LIGHTED DISPLAY

PWB Mount
(Standard plunger)

Panel Mount
(Standard plunger)

PWB Mount
(One-piece plunger)

FEATURES
- Silver or gold contacts
- Choice of rectangular or square housings
- Accepts one LED or incandescent lamp
- Printed wiring board or snap-in panel mounting
- Bezels and mounting clips, LEDs and legended lenses can be furnished installed or ordered separately
- UL recognized, CSA certified

Example: MML21KK3AAK
Electronic control pushbutton switch with standard plunger; rectangular housing (black); bezel (black); mounting clips on long sides, PWB terminals; 1-pole, momentary action, silver contacts, black plunger.

Example: MML21KK3AAKRSDR
As above, except furnished with red LED and red lens installed.

MML21KK3AAHRSXX20 as above, legended.

MML21 STANDARD PLUNGER SWITCHES ORDER GUIDE

Catalog listing codes for switch, less assembled display options

MML21K — **K** — **3** — **AA**

Housing Type
MML21K Rectangular Black Housing **MML21H** Square Black Housing

Mounting	
Rectangular	**Square**
A No bezel (PWB mounting) **K** Black bezel, mtg. clip/long sides	**A** No bezel (PWB mounting) **R** Black bezel & mtg. clip

Terminals
3 Printed Wiring Board **2** Solder

Circuitry/Action (Each pole is double throw)	
Rectangular	**Square**
Silver Contacts: **AA** 1 pole, mom. action **AB** 1 pole, alt. action **AC** 2 pole, mom. action **AD** 2 pole, alt. action	**Silver contacts:** **AA** 1-pole, mom. action **AB** 1-pole, alt. action
Gold Contacts: **BA** 1 pole, mom. action **BB** 1 pole, alt. action **BC** 2 pole, mom. action **BD** 2 pole, alt. action	**Gold contacts** **BA** 1-pole, mom. action **BB** 1-pole, alt. action

MML21 ONE PIECE LENS/PLUNGER SWITCHES ORDER GUIDE

Catalog listing codes for switch, less assembled display options

MML21H — **K** — **3** — **AA**

Housing Type
MML21K Rectangular Black Housing **MML21H** Square Black Housing

Mounting	
Rectangular	**Square**
A No bezel (PWB mounting) **K** Black bezel, mtg. clip/long sides	**A** No bezel (PWB Mounting) **R** Black bezel & mtg. clip

Terminals
3 Printed Wiring Board **2** Solder

Circuitry/Action (Each pole is double throw)	
Rectangular	**Square**
Silver Contacts: **AA** 1 pole, mom. action **AB** 1 pole, alt. action **AC** 2 pole, mom. action **AD** 2 pole, alt. action	**Silver contacts:** **AA** 1-pole, mom. action **AB** 1-pole, alt. action
Gold Contacts: **BA** 1 pole, mom. action **BB** 1 pole, alt. action **BC** 2 pole, mom. action **BD** 2 pole, alt. action	**Gold contacts** **BA** 1-pole, mom. action **BB** 1-pole, alt. action

Electrical Data	page 69
Bezels	page 84
Strip and matrix mounting	page 83
PWB pin locations	page 91

Order display options assembled to switch by adding codes below[3]

K

Plunger Type

K	Black
W	White

RS

LED*

XX	No Led[4]
RS	Red[5]
YS	Yellow[5]
GS	Green[5]

DR

Lens

XX No Lens

For LED Display		For Incandescent or Unlighted Display	
DR	Red	LR	Red
DY	Yellow	LY	Yellow
DG	Green	LG	Green
		LW	White
		LK	Black

Legend

20
With Legend (Leave Blank if no legend needed

Use Legend Order Sheet FO-74024 to cover each catalog listing. (See page 80.)

CUSTOMER INSTALLATION:

LED
1. Order LED and receptacle, page 84.
2. Installation instructions, page 85/87.

Incandescent Lamp
1. Order lamp/PWB receptacle or lamp/solder receptacle, page 86.
2. Installation instructions, page 87.

Manuals

Order display options assembled to switch by adding codes below

H

Button Color (One Piece Plunger)

For LED Display		For Incandescent or non-light display	
H	Red	R	Red
L	Yellow	Y	Yellow
N	Green	G	Green
		Z	Black

RS

LED*

XX	No LED[4]
RS	Red[5]
YS	Yellow[5]
GS	Green[5]

Legend

XX20
With Legend (Leave Blank if no legend needed

Use Legend Order Sheet FO-74024 to cover each catalog listing. (See page 81.)

***Notes:**
1. When an LED is specified in a **rectangular** MML21 listing, MICRO SWITCH will permanently install it in the housing.
2. MICRO SWITCH does **not** permanently install an LED in a **square** MML21 listing. To install an LED in a square housing, order a MML93L or MML93G receptacle and a MML92 LED (see pages 86 and 88).
3. Include four digits (XXXX or XX DR) when a legend is required.
4. For square or rectangular only.
5. For rectangular only.

Manual Switches

Electronic Control Rocker Switches

LED, INCANDESCENT, OR NON-LIGHTED DISPLAY

PWB Mount

Panel Mount

PWB Mount
(Lighted rocker)

FEATURES

- Accepts one or two LEDs or incandescent lamps which are ordered separately
- Printed wiring board mounting or snap-in panel mounting
- Bezels and mounting clips can be furnished installed or ordered separately
- UL recognized, CSA certified

MML24 ORDER GUIDE (Catalog listing for switch, less assembled display options)

MML24K	A	3	AA
Housing Type	**Mounting**	**Terminals**	**Circuitry**
MML24K Black housing	**A** No bezel (PWB mounting) **K** Black bezel, mtg. clip/long sides	**3** Printed wiring board **2** Solder	Insert code letters from Circuitry Chart

Manual Switches
Electronic Control Rocker

Electrical Data	page 69
Bezels	page 84
Strip and matrix mounting	page 83
Mounting dimensions	pages 97/98
PWB pin locations	page 97

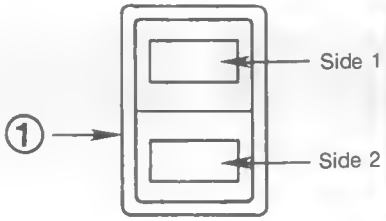
Rockers are permanently installed.

CIRCUITRY

Silver Contacts	Gold Contacts	2-Position	3-Position			
AA	BA	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3
AC	BC	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6

⚠ The "MICRO SWITCH" identification is shown on this side of the switch housings.

Example: MML24KA3AA01HDRXX
Electronic control rocker switch with black housing, printed wiring board terminals; 1 pole, silver contacts; 2-position, maintained action; one circuit ON in each position; black rocker, red lens for LED display in Side 1 and no lens in Side 2.



OPERATING ACTION

2-Position	01	Maint.	None	Maint.
	02	Mom.	None	Maint.
	03	Maint.	None	Mom.
3-Position	04	Maint.	Maint.	Maint.
	05	Mom.	Maint.	Mom.
	07	Mom.	Maint.	Maint.

Order display options assembled to switch by adding codes below.

01

Action
Insert code numbers from Operating Action Chart

H

Rocker
- **K** Black rocker, non-lighted
- **H** Black rocker, one lens*
- **F** White rocker, one lens*

* Lighted switches with solder terminals require MML93R receptacle to install lamps or LEDs. See page 88.

DRXX

Lens

Side 1		Side 2	
XX None		**XX** None	
LED display:	Incand. display:	LED display:	Incand. display:
DR Red	**LR** Red	**DR** Red	**LR** Red
DY Yellow	**LY** Yellow	**DY** Yellow	**LY** Yellow
DG Green	**LG** Green	**DG** Green	**LG** Green
	LW White		**LW** White

Leave blank, if legend not desired

Legend
20 With legend

Use legend order sheet FO-74193 to cover each catalog listing (see page 82).

CUSTOMER INSTALLATION:

LED
1. Order LED and receptacle, page 85.
2. Installation instructions, pages 86/88.

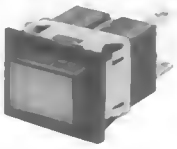
Incandescent Lamp
1. Order lamp/PWB receptacle or lamp/solder receptacle, page 87.
2. Installation instructions, page 88.

Manuals

Manual Switches
Power Duty Pushbutton

NON-LIGHTED DISPLAY

PWB Mount



Panel Mount

FEATURES

- Printed circuit board or snap-in panel mounting
- Bezels and mounting clips, and legended lenses can be furnished installed or ordered separately
- UL recognized, CSA certified.

Example: MML31KK2AAK
Power duty pushbutton switch housing (black); bezel (black) and mounting clips; solder terminals; 1 pole, momentary action; black plunger.

Example: MML31KK2AAKLR
As above, except furnished with red lens.

MML31 ORDER GUIDE

Catalog listing codes for switch, less assembled display options

MML31K	K	2	AA
Housing Type (Rectangular)	**Mounting**	**Terminals**	**Circuitry/Action** (Each pole is single-throw, normally open)
MML31K Black housing, non-lighted	**A** No bezel (PWB mounting) **K** Black bezel, mtg. clip/long sides	**3** Printed wiring board **2** Solder/Quick-connect	**AA** 1 pole, mom. action **AB** 1 pole, alt. action **AC** 2 poles, mom. action **AD** 2 poles, alt. action

Electrical Data	page 69
Bezels	page 84
Strip and matrix mounting	page 83
Mounting dimensions	pages 97/98
PWB pin locations	page 97

Order display options assembled to switch by adding codes below

K

Plunger
K Black

LR

Lens
LR Red
LY Yellow
LG Green
LW White
LK Black

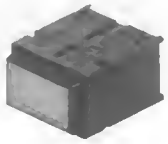
Leave this space blank, if legend not desired

Legend
20 With Legend
Use Legend Order Sheet FO-74024 to cover each catalog listing (see page 81).

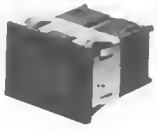
Manual Switches
Indicators/Pushbutton Style

MML41/46 Series

LED OR INCANDESCENT DISPLAY



PWB Mount



Panel Mount

FEATURES
- Accepts one LED or incandescent lamp

MML41 indicators resemble a pushbutton switch with the button in the "down" position.

MML41 ORDER GUIDE

Catalog listing codes for indicator, less assembled display options

MML41K

Housing Type (Rectangular)
MML41K Black housing

A

Mounting
A No bezel (PWB mounting only)
K Black bezel, mtg. clip/long sides

3

Support Posts/Terminals
3 PWB* ("A" mtg. only)
2 Solder
0 None*** For panel mount and strip/matrix mount

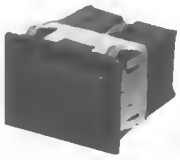
K

Plunger
K Black

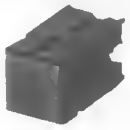
Indicators/Flush Mount MML46

LED OR INCANDESCENT DISPLAY

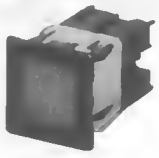
PWB Mount



Panel Mount



PWB Mount



Panel Mount

FEATURES
- Accepts one or two LEDs or incandescent lamps
- Bezels and mounting clips, LEDs and legended lenses can be furnished installed or ordered separately

MML46 ORDER GUIDE

Catalog listing codes for indicator, less assembled display options

MML46K

Housing Type	
Rectangular* (1 or 2 LEDs or incand. lamps)	**Square*** (1 LED or incand. lamp)
MML46K Black housing	**MML46H** Black housing

A

Mounting	
Rectangular:	**Square:**
A No bezel (PWB mounting only)	A No bezel (PWB mounting only)
K Black bezel, mtg. clip/long sides	R Black bezel, mounting clips

3

Support Posts
3 PWB ("A" mtg. only)
2 Solder**
0 None*** For snap-in and strip/matrix mount

** Rectangular housings only.
*** No LEDs allowed.

*** Notes:**
1. When an LED is specified in a **rectangular** MML46 listing, MICRO SWITCH will permanently install it in the housing.
2. MICRO SWITCH does **not** permanently install an LED in a **square** MML46 listing. To install an LED in a square housing, order a MML93L or MML93G receptacle and a MML92 LED (see pages 86 and 88).

Manual Switches

Indicators/Pushbutton Style

Example: MML41KA3K
Pushbutton style indicator housing (black); no bezel; support posts; black plunger.

Example: MML41KA3KRSDR
As above, except furnished with one red LED and red lens.

Electrical Data	page 69
Lenses	page 80
Bezels	page 84
LEDs/Lamps	pages 85/87
Strip and matrix mounting	page 83
Mounting dimensions	pages 92/94/95
PWB pin locations	pages 92/94

Order display options assembled to indicator by adding codes below

RS

LED (Stanley type)

XX	None
RS	Red
YS	Yellow
GS	Green

DR

Lens

For LED display:		For incandescent or non-lighted display:*	
DR	Red	**LR**	Red
DY	Yellow	**LY**	Yellow
DG	Green	**LG**	Green
		LW	White
		LK	Black

* When ordering incandescent or non lighted display, LED field must be **XX**.

Leave this space blank if legend not desired

Legend

20 With legend

Use Legend Order Sheet FO-74024 to cover each catalog listing (see page 82). Note: If legend is not desired, leave this space blank.

Example: MML46KA3
Indicator housing, rectangular (black); no bezel; support terminals.

Example: MML46KA3RSXXDR20
As above, except furnished with red LED and red lens, with legend.

CUSTOMER INSTALLATION:

LED
1. Order LED and receptacle, page 85.
2. Installation instructions, pages 86/88.

Incandescent Lamp
1. Order lamp/PWB receptacle or lamp/solder receptacle, page 87.
2. Installation instructions, page 88.

LED TERMINATION
If LEDs are to be permanently installed by MICRO SWITCH, please indicate by either a **2** (solder) or a **3** (PWB) for the Support Posts listing code. With MICRO SWITCH identification to the rear, the longest lead (+) anode will be to the left, closest to the double-pole circuit or support terminals.

Style 2

Style 3

Manuals

Order display options assembled to indicator by adding codes below

RSXX

LED (Stanley type)

Available in rectangular housings only.

XXXX	No LED		
One LED*:		Two LEDs:	
RSXX	Red	**RSRS**	Red
YSXX	Yellow	**YSYS**	Yellow
GSXX	Green	**GSGS**	Green

Square housings accept only one **LED**. Only a two-character LED code is necessary. Example: MML46HR0**XX**DY.

DR

Lens

For LED display:		For incandescent or non-lighted display:*	
DR	Red	**LR**	Red
DY	Yellow	**LY**	Yellow
DG	Green	**LG**	Green
		LW	White
		LK	Black

* When ordering incandescent or non-lighted display, LED field must be **XXXX**.

Leave this space blank if legend not desired

20

Legend

20 With legend

Use Legend Order Sheet FO-74024 to cover each catalog listing.

Manual Switches

Button Lenses/Incandescent or Non-lighted Display

MML51 ORDER GUIDE
For standard plunger MML pushbuttons.

MML51E

Lens Type
Rectangular Lenses:
MML51E
Switch lens*
MML51G
Indicator lens
Square Lenses:
MML51C
Switch lens
MML51D**
Indicator lens

* Use MML51E with MML41 rectangular pushbutton style indicators.
** MML51D for use with MML41 square.

20

Display/Legend Type
Transmitted Color:
10 No legend
20 With legend

R

Color	
R	Red
Y	Yellow
G	Green
W	White
K	Black (Opaque)

Example: MML51E20R
Incandescent or non-lighted display switch lens; red transmitted color, with legend.

LEGENDING
Use the MML Legend Order Sheets on pages 81 and 82 to specify legending.

Button Lenses/LED MML52

MML52 ORDER GUIDE
For standard plunger MML pushbuttons.

MML52G

Lens Type
Rectangular Lenses:
MML52E
Switch lens, LED display
MML52G*
Indicator lens
LED display
Square Lenses:
MML52C
Switch lens, LED display
MML52D**
Indicator lens, LED display

* Use MML52E with MML41 rectangular pushbutton style indicators.
** Use MML52D with MML41 square.

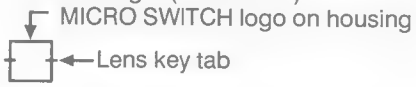
10

Display/Legend Type
Transmitted Color:
10 No legend
20 With legend

Y

Color/ Illumination
LED Display:
R Red
Y Yellow
G Green
C Clear

Square lenses have tabs on two sides. Before snapping in place, the tabs should be at right angles to the housing side with the MICRO SWITCH logo. (See below.)



Example: MML52G10Y
LED display indicator lens; yellow transmitted color, no legend.

HOW TO INSTALL LENSES
Keytabs on two sides of the lenses mate with matching button slots.

Rectangular lenses have tabs on the long sides. Seat a long side before snapping in place.

HOW TO INSTALL LENSES

1. Seat lens.

2. Snap in place.

Honeywell

MML Pushbutton/Indicator Lens

Legend Order Guide/Product Specification (PG____of____)

Switch & Indicator Lense Type Orientation		Figure No	Max Lines/Area 5/64	7/64	9/64	13/64	Max Characters/Line 5/64	7/64	9/64	13/64
	C	1	2	1	1	1	3	2	2	1
	D	2	2	1	1	1	4	3	2	2
	E	3	1	1	1	1	6	4	3	2
	G	4	2	1	1	1	7	4	4	3

Catalog Listing MML 5 _		
Customer P.O. No.	Customer Dwg. No.	
MICRO SWITCH Sales Order	Line Number	Schedule No.

Customer: _____

Address: _____

_____ (city) _____ (state)

Instructions

1. Fill in appropriate catalog listing - one listing/sheet.
2. Check proper figure #. Type size, Type color.
3. Fill in quantity required.
4. Indicate legends desired — Do not exceed maximums shown in Legend Order Guide.

Note

1. For Proper Legend Orientation, MML housings (when viewed from front of panel) should have "MICRO SWITCH" logo oriented "UP"
2. All legends will be centered within Legend Area.
3. Please use black ink in filling out this form to help us process your order.

LEGEND ORDER CHART

Customer Part No	Fig No	Type Size 5/64	7/64	9/64	13/64	Ink Color Black	White	Button Qty	Legend Description 1st Line	2nd Line

FO-74024-B

_____ (Signature) _____ (Date)

Hot Stamp Legending

Modified Gothic lettering (A thru Z), numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, and 13/64.	A3 Modified Gothic

STANDARD SYMBOLS AVAILABLE

.	,	:	;	!	?	'	_	"	/	(	)	*	&
$	¢	#	%	°	+	-	±	÷	x	=	≠	>	<
→	↑	↓	←	CR	1/4	1/2	3/4	1/3	2/3	@	∞		

SPECIAL LEGENDS

NOTE: Use this area to show special Legend Locations or Configurations NOT shown above. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A"	Fig. "B"

Honeywell

MML ROCKER LEGEND ORDER GUIDE/PRODUCT SPECIFICATION (PG____of____)

Switch Type & Orientation		Figure No	Max Lines/Area 5/64	7/64	9/64	13/64	Max Characters/Line 5/64	7/64	9/64	13/64
MML 24, 34 .4 x .6 Size		1	2	1	1	1	3	2	2	1
		2	1	1	1	1	3	3	2	1
MML 24, 34 .4 x .6 Size Umbrella and MML 34 .6 x .8 Size		3	3	2	2	1	4	3	3	2
		4	2	1	1	1	6	4	4	2

Note

1. For Proper Legend Orientation, MML housings (when viewed from front of panel) should have "MICRO SWITCH" logo oriented to the left. For other Orientation, indicate the Housing Logo Location in Special Legend Area.
2. All legends will be centered within Legend Area.
3. Please use black ink in filling out this form to help us process your order.

Catalog Listing MML		
Customer P.O. No.	Customer Dwg. No.	
MICRO SWITCH Sales Order	Line Number	Schedule No.

Customer: _____

Address: _____

_____
(city) (state)

Instructions

1. Fill in appropriate catalog listing - one listing/sheet.
2. Check proper figure #. Type size, Type color.
3. Fill in quantity required.
4. Indicate legends desired — Do not exceed maximums shown in Legend Order Guide.

Modified Gothic lettering (A thru Z). numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, and 13/64.	A3 Modified Gothic

STANDARD SYMBOLS AVAILABLE

.	,	:	;	!	?	'	_	"	/	(	)	*	&	
$	¢	#	%	°	+	-	±	÷	x	=	≠	>	<	
→	↑	↓	←	CR	1/4	1/2	3/4	1/3	2/3	@	∞			

LEGEND ORDER CHART

Customer Part No	Fig No	Side No	Type Size 5/64	7/64	9/64	13/64	Ink Color Black	White	Button Qty	Legend Description 1st Line	2nd Line

SPECIAL LEGENDS

NOTE: Use this area to show special Legend Locations or Configurations NOT shown above. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A"	Fig. "B"

FO-74193-B

_____
(Signature)

Manual Switches
Strip Mounting Frames

MML61 ORDER GUIDE

MML61K **5**

Orientation/Color
For Rectangular* Housings:
MML61K
Horizontal strip, black
MML61G
Vertical strip, black
For Square Housings
MML61J
Black

* * .4" x .6" housings only.

No. of Stations	
1	One
2	Two
3	Three
4	Four
5	Five
6	Six
7	Seven
8	Eight
9	Nine
10	Ten

Note: Switches and indicators are ordered as separate items.

FEATURES
- Provides back of panel or printed wiring board mounting in a multi-unit strip of switches/indicators.
- Devices can be pre-wired prior to installation.
- Holes at each end of frame will accept No. 4 screws.
- Can be used for pushbutton or rocker type switches.

Example: MML61K5
Black 5-station strip mounting frame, horizontal orientation.

1. Slip mounting clip over top of switch/ indicator housing.

2. Snap bezel onto mounting clip.

Recommended panel thickness for panel mounted units is .050 to .094 in. (1,27 to 2,39 mm).

MML72EEK
(Black switch bezel, mounting clips on long sides)

TO ORDER MOUNTING CLIPS SEPARATELY

For Rectangular Housings:	
MML73EA	(long sides)
MML73EB	(short sides)

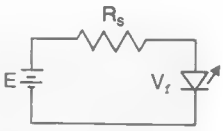
LED APPLICATION INFORMATION

To insure stable conditions, suitable external control of the LED current must be provided. It is recommended that a minimum of 5 VDC open circuit voltage with an appropriate series resistance be used to drive LED devices. This minimizes current variation and its effect on temperature and forward voltage of the LED.

Maximum drive current is 30 mA. Reverse voltage breakdown of the LED's is 4 volts (min.).

Resistor values can be determined by supply voltage or current for LED:

$$Rs = \frac{E - V_f}{I_f}$$



WHERE: Rs = Series Resistance
E = Supply Voltage
Vf = Forward Voltage of LED
If = Circuit Current

MML92 ORDER GUIDE

LEDs should be the same color as the lenses they illuminate. They are packed 10 per listing, including stand-off spacers for use when solder terminating to a printed wiring board, per procedure 3 on page 86.

LED Type	Use To Illuminate	Catalog Listing	LED Color	Forward Characteristics Typ. @ 20mA	Max.	LED Manufacturers' Part Numbers
T–1¾	Rectangular button lens				**Stanley:**	
		MML92ERS	Red	1.7 V	2.0 V	ESBR5633
		MML92EGS	Green	2.1 V	2.5 V	ESBG5633
		MML92EYS	Yellow	2.1 V	2.5 V	ESAY5633
					Hewlett Packard:	
		MML92ERH	Red	2.2 V	3.0 V	HLMP-3366
		MML92EGH	Green	2.3 V	3.0 V	HLMP-3568
		MML92EYH	Yellow	2.2 V	3.0 V	HLMP-3466
T–1	Square button lens, MML24 rocker lens rectangular button lens				**Stanley:**	
		MML92HRS	Red	1.7 V	2.0 V	ESBR3901
		MML92HGS	Green	2.1 V	2.5 V	ESPY3901
		MML92HYS	Yellow	2.2 V	2.5 V	ESAY3901
					Hewlett Packard:	
		MML92HRH	Red	2.2 V*	3.0 V	HLMP-1340
		MML92HGH	Green	2.3 V*	3.0 V	HLMP-1540
		MML92HYH	Yellow	2.2 V	3.0 V	HLMP-1440

Long lead: Anode (+). Short lead: Cathode (–).
* @ 25 mA.

MML93 LED PWB RECEPTACLE ORDER GUIDE

LED Type	Use to Illuminate	Catalog Listing
T-1¾	Rectangular button lens or umbrella button lens	MML93K
T-1	Square button lens or MML24 rocker lens	MML93G

MML93 LED SOLDER TERMINAL ORDER GUIDE

LED Type	Use to Illuminate	Catalog Listing
T-1	Square button (base only)	MML93L
T-1	MML24 rocker lens (base only)	MML93R
T-1	Rectangular button (base and terminal)	MML93J

Factory installed. Certain MML switches and indicators can be furnished with LEDs **permanently** factory installed, where specified in the order guides.

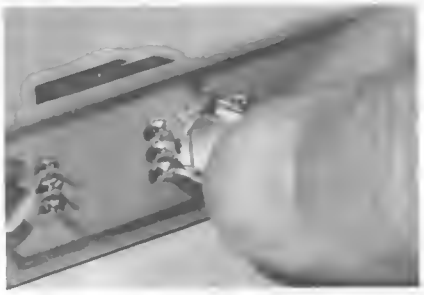
User installed. LEDs can also be ordered separately and installed in these products by the user, per the procedures described below.

LED INSTALLATION

1. **With Printed Wiring Board Receptacle. (MML93K)**
   PWB receptacle enables T-1 ¾ or T-1 LEDs to be added or replaced from behind the printed wiring board, without soldering. LEDs and receptacles are ordered separately. See page 87.

   Printed wiring boards are not supplied.

1. Insert the LED/PWB receptacle assembly through a hole in the printed wiring board.



2. A ⅛–turn applied clockwise to the receptacle locks it in the printed wiring board and establishes the electrical connection.

2. **With Solder Terminal Receptacle. (MML93J)**
   This receptacle attaches directly to the rear of panel-mounted units. It enables incandescent lamps to be added or replaced without rewiring. LEDs and receptacles are ordered separately.

   This receptacle is for use with all rectangular pushbuttons and MML41 or MML46 rectangular indicators only.

1. Insert solder terminal receptacle into hole in base of panel mount unit.

2. A ⅛–turn clockwise applied to the receptacle locks it in the base.

3. **By Soldering To Printed Wiring Board.**
   In this procedure, the housing is mounted on the printed wiring board after the T-1 ¾ LED has been seated.

   This procedure can be used with any MML having PWB terminals.

1. Assemble stand-off spacer to LED terminals and seat on printed wiring board.

2. Seat housing on printed wiring board, with LED projecting into hole at the base of the housing.

4. **By Soldering to Printed Wiring Board or Leadwire (MML44 indicators only).**
   T-1 ¾ LEDs are added to MML44 indicators via a procedure which is unique to this product. The LED is inserted from the top of the housing with the leadwires protruding through the housing base.

1. Assemble LED to MML44 indicator, with the LED terminals protruding through assembly slot in the middle of housing base.

2. Use pencil eraser to snap LED securely in place.

Manual Switches

Incandescent Lamp Assemblies

MML91 LAMP/PWB RECEPTACLE ORDER GUIDE

Lamp Type	Use To Illuminate	Voltage	Catalog Listing Incl. Lamp & PWB Receptacle	Industry Lamp No.
T-1 ① (unbased)	**Rectangular** button lens	**5** 28	MML91C MML91DC	715 6838
T-1 ② (bi-pin)	Square button lens and MML24 rocker lens	5 28	MML91E MML91DE	7715 7839

Notes:
① To order PWB receptacle separately, specify **MML93H.**
② To order PWB receptacle separately, specify **MML93G.**

MML91 LAMP/SOLDER RECEPTACLE ORDER GUIDE

Lamp Type	Use To Illuminate	Voltage	Catalog Listing Incl. Lamp & Solder Receptacle	Industry Lamp No.
T–1 ③ (bi-pin)	**Rectangular** button lens	5 28	MML91D MML91DD	7715 7839

Lamp Type	Use To Illuminate	Voltage	Catalog Listing ④ Solder Receptacle	Catalog Listing ④ T-1 (Unbased) Lamp Only	Industry Lamp No.
T-1 (unbased)	**Square** button lens	**5** 28	MML93L MML93L	MML91A MML91DA	715 6838
T-1 (unbased)	MML24 rocker lens	5 28	MML93R MML93R	MML91A MML91DA	715 6838

Notes:
③ To order solder receptacles separately, specify **MML93J.**
④ Order solder receptacles and T-1 lamp listings for complete assembly.

Manual Switches

LED/Incandescent Lamp Receptacles

User installed. Certain MML switches and indicators will accept incandescent lamps, where specified in the order guides. These lamps are ordered separately and installed by the user, per the procedures described below.

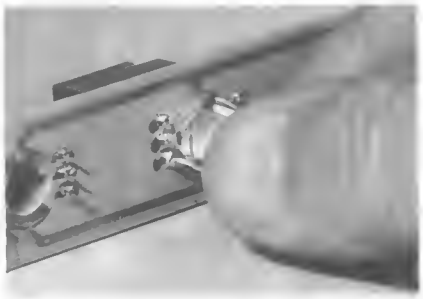
LAMP INSTALLATION

1. **With Printed Wiring Board Receptacle for MML93G and MML93H only.**
   Use PWB receptacles to permit lamps to be added or replaced from behind the printed wiring board, without soldering.

   These receptacles are for use with rectangular pushbuttons, square pushbuttons and MML24 rocker lens only.

   Printed wiring boards are not supplied.

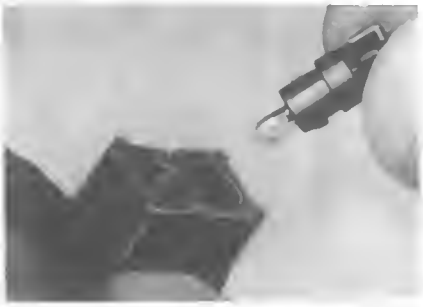
1. Insert the PWB receptacle/ incandescent lamp assembly through a hole in the printed wiring board.



2. A ⅛–turn applied clockwise to the receptacle locks it in the printed wiring board and establishes the electrical connection.

2. **With Solder Terminal Receptacle for MML93J bi-pin only**
   This receptacle attaches directly to the rear of panel-mounted units. It enables lamps to be added or replaced without rewiring.

   This receptacle is for use with all rectangular pushbuttons and MML41 or MML46 rectangular indicators only.

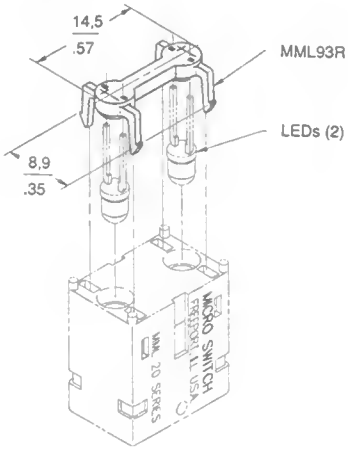


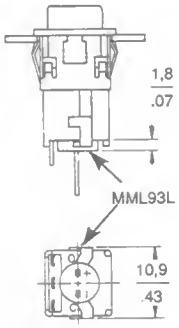
1. Insert solder terminal receptacle into hole in base of panel mount unit.

2. A ⅛–turn clockwise applied to the receptacle locks it in the base.

3. **With Solder Terminal Receptacles for MML93L/93R Unbased Only or T-1 LED.**
   Use the receptacles shown at right to install T–1 LEDs or T–1 unbased lamps in panel-mounted MML21 square pushbutton switches and MML24 rocker switches.

Procedure:
1. Assemble LEDs or lamps to receptacles (leads first).
2. Snap receptacle into slots in housing base.
3. Solder directly to leads.



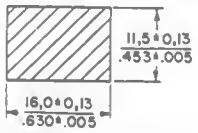


Manual Switches
Miniature Manual Line

MOUNTING DIMENSIONS (For reference only)

PANEL CUTOUTS FOR PUSHBUTTON SWITCHES AND INDICATORS/RECTANGULAR TYPE

INDIVIDUAL SNAP-IN PANEL MOUNT

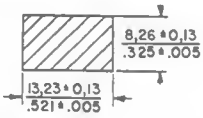


1,27 — 2,39
.050 — .094
Panel Thickness

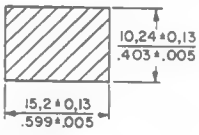
PANEL PUNCH FOR MML SERIES

A panel punch is manufactured by Greenlee-Textron Tool Co., Rockford, IL (815-926-3011).

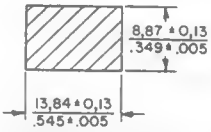
INDIVIDUAL PRINTED WIRING BOARD (PWB) MOUNT



Pushbutton Plunger Thru Panel

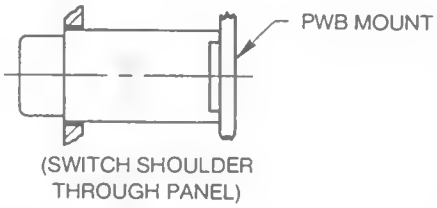


Housing Thru Panel

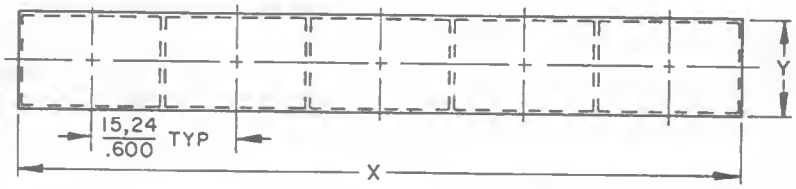


Indicator Lens Thru Panel

MULTI-UNIT PRINTED WIRING BOARD (PWB) MOUNT



Horizontal Mount



Establish tooling holes on X coordinate and use these holes to establish relationship between PWB and Panel

Terminals $\frac{0,20}{.008} \times \frac{0,76}{.030}$

Recommended hole size in PWB $\frac{1,17}{.046}$

N = Number of switches

$X = N\text{-}1 \times \frac{15,24}{.600} + \frac{15,11}{.595}$

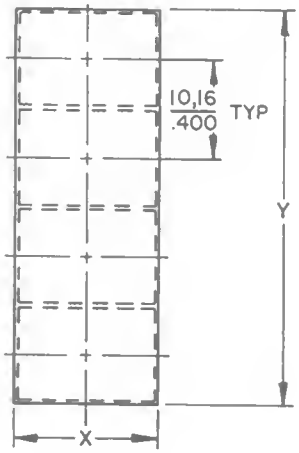
$Y = \frac{10,16}{.400}$

Example: N = 5 Switches

$X = 5\text{-}1 \times \frac{15,24}{.600} + \frac{15,11}{.595}$

$X = \frac{76,07}{2.995}$

Vertical Mount



N = Number of Switches

$Y = N \times \frac{10,16}{.400}$

$X = \frac{15,11}{.595}$

Example: N = 4

$Y = 4 \times \frac{10,16}{.400}$

$Y = \frac{40,64}{1,600}$

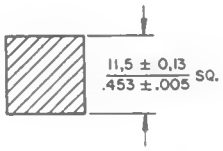
Manuals

Manual Switches
Miniature Manual Line

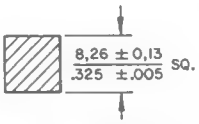
MOUNTING DIMENSIONS (For reference only)

PANEL CUTOUTS FOR PUSHBUTTON SWITCHES AND INDICATORS/SQUARE TYPE

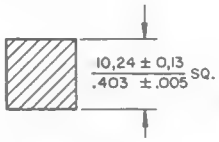
Individual Snap-in Panel Mount



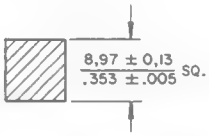
Individual Printed Wiring Board PWB Mount



Pushbutton Plunger Thru Panel



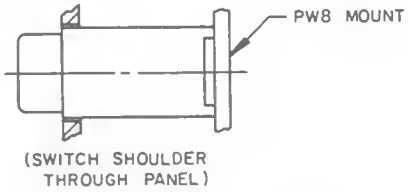
Housing Thru Panel



Indicator Lens Thru Panel

See page 88 for panel punch manufacturer.

MULTI-UNIT PRINTED WIRING BOARD (PWB) MOUNT

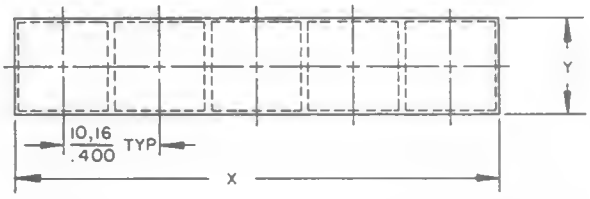


Establish tooling holes on X coordinate and use these holes to establish relationship between PWB and Panel

Terminals $\frac{0,20}{.008} \times \frac{0,76}{.030}$

Recommended hole size in PWB $\frac{1,17}{.046}$

Horizontal Mounting



Formula:
N = Number of switches

$X = N \times \frac{10,16}{.400}$

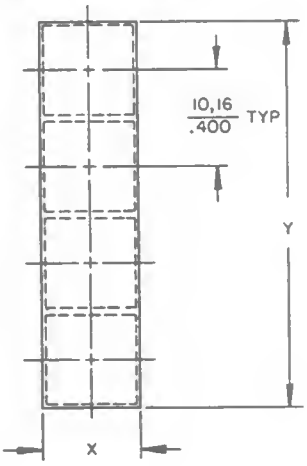
$Y = \frac{10,16}{.400}$

Example: N = 5 Switches

$X = 5 \times \frac{10,16}{.400}$

$X = \frac{50,80}{2.00}$

Vertical Mounting



N = Number of Switches

Formula: $Y = N \times \frac{10,16}{.400}$

$X = \frac{10,16}{.400}$

Example: N = 4

$Y = 4 \times \frac{10,16}{.400}$

$Y = \frac{40,64}{1.600}$

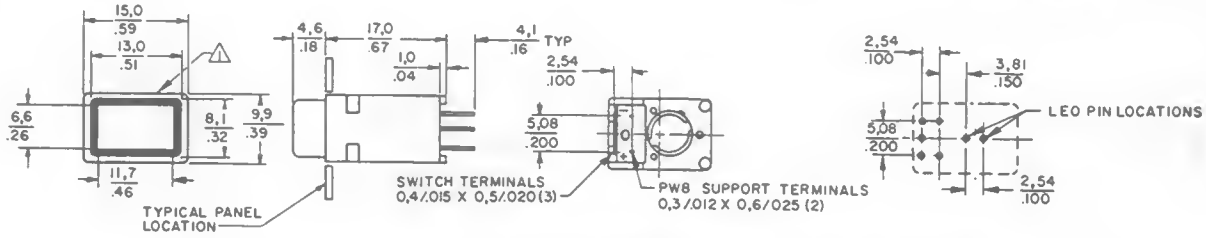
Manual Switches
Miniature Manual Line

MOUNTING DIMENSIONS (For reference only)

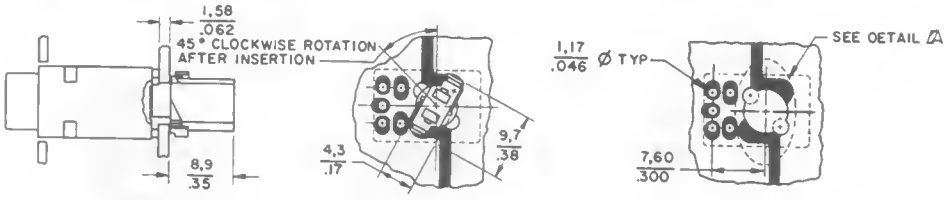
PRINTED WIRING BOARD MOUNT PUSHBUTTON SWITCHES/RECTANGULAR TYPE

MML11 Switches

PWB Pin Locations

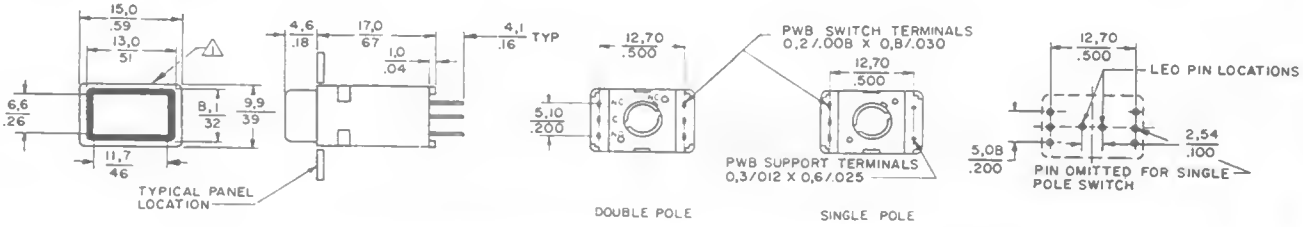


PWB Receptacle Installed (LED or Incandescent Lamp)

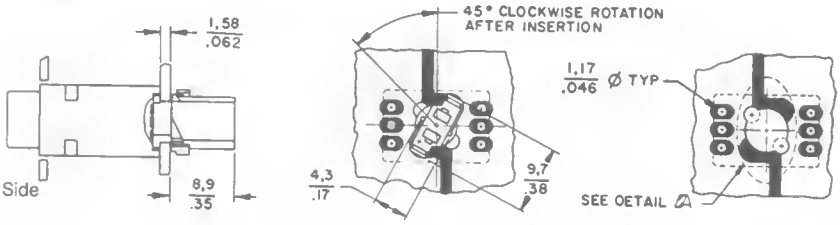


MML21 Switches

PWB Pin Locations

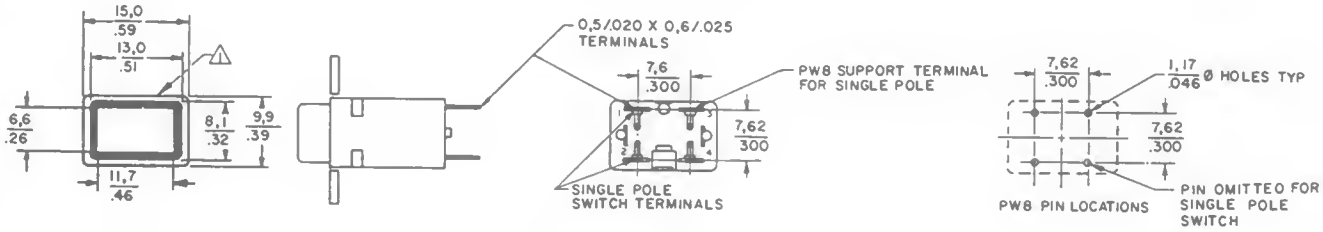


PWB Receptacle Installed (LED or Incandescent Lamp)



Notes:
⚠ MICRO SWITCH Identification This Side
2 – Linear measure mm/IN. or mm/IN.

MML31 Switches



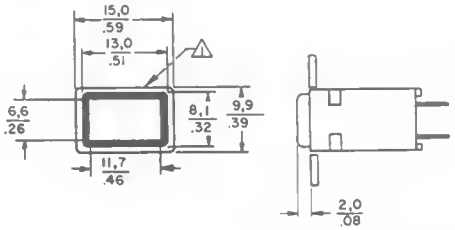
Manuals

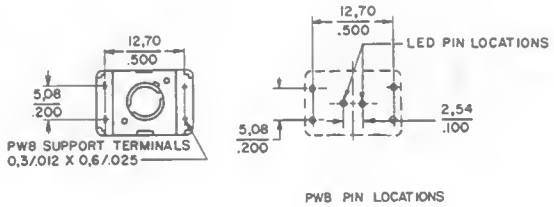
Manual Switches
Miniature Manual Line

MOUNTING DIMENSIONS (For reference only)

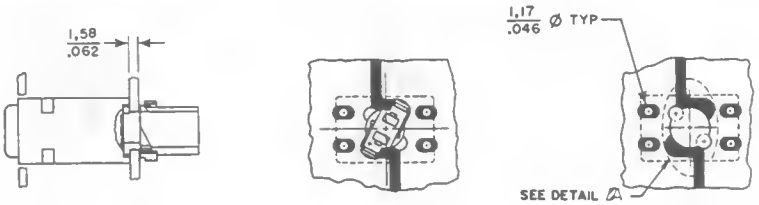
PRINTED WIRING BOARD MOUNT INDICATORS/RECTANGULAR TYPE

MML41 Indicators



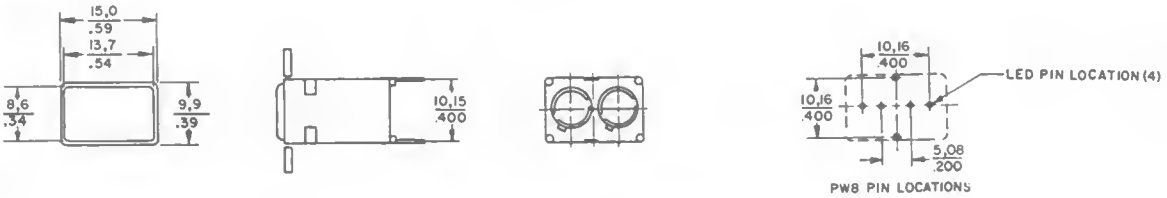


PWB Receptacle Installed (LED or Incandescent Lamp)

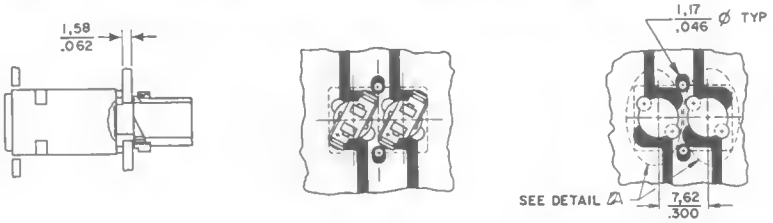


Notes:
⚠ MICRO SWITCH Identification This Side
2 – Linear measure mm/IN. or mm/IN.

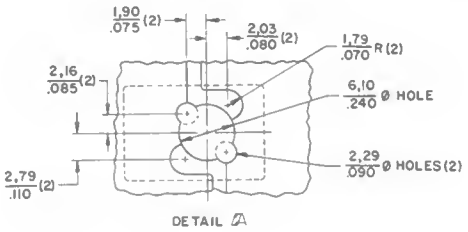
MML46 Indicators



PWB Receptacle Installed (LED or Incandescent Lamp)



PWB Pad Location For Receptacle (LED or Incandescent Lamp)



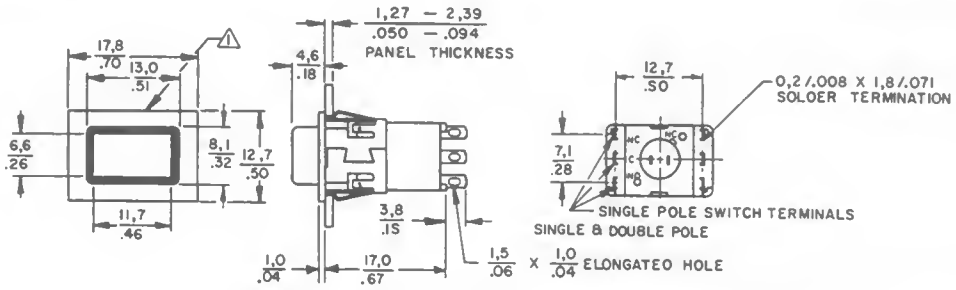
Manual Switches

Miniature Manual Line

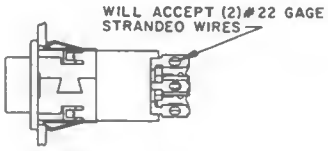
MOUNTING DIMENSIONS (For reference only)

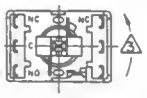
PANEL MOUNT PUSHBUTTON SWITCHES/RECTANUGLAR TYPE

MML21 Switches



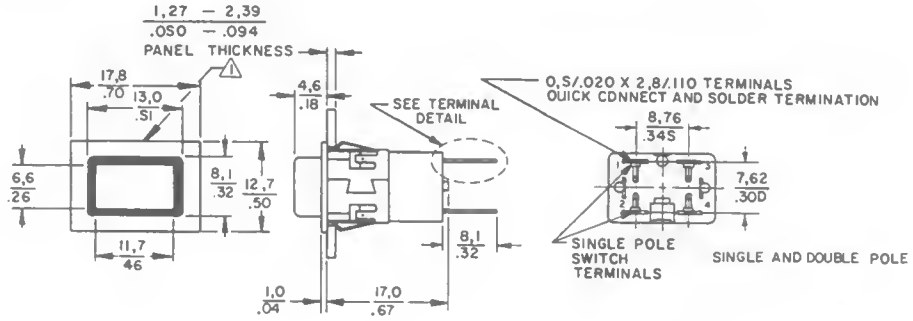
Solder Receptacle Installed (LED or Incandescent Lamp)



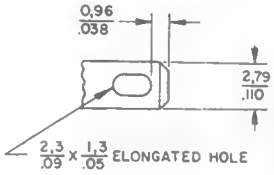


Notes:
1 MICRO SWITCH Identification This Side
2 – Linear measure mm/IN. or mm/IN.
3 Rotate 45° counter clockwise for removal from switch or indicator

MML31 Switches



Terminal Detail



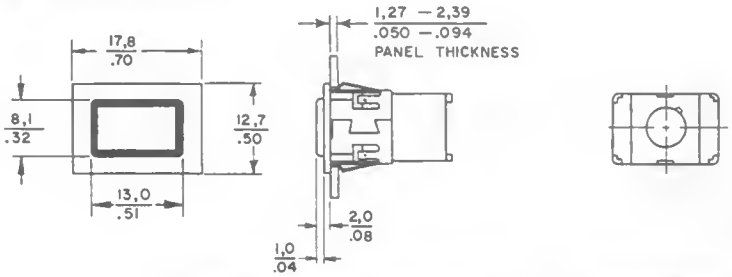
Manuals

Manual Switches
Miniature Manual Line

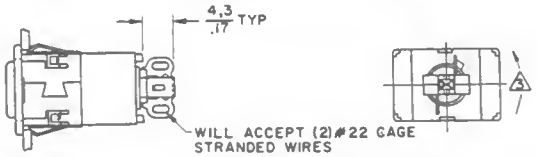
MOUNTING DIMENSIONS (For reference only)

PANEL MOUNT INDICATORS/RECTANGULAR TYPE

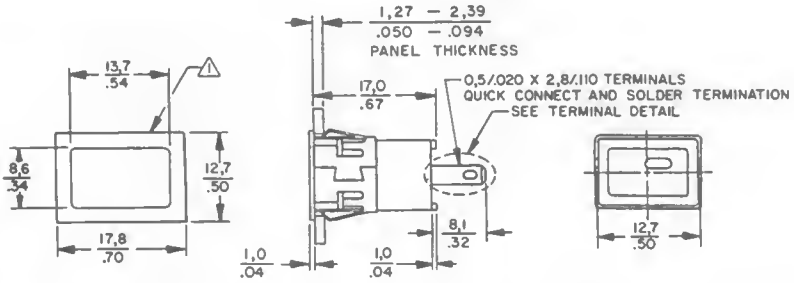
MML41 Indicators



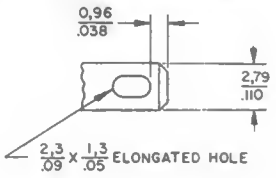
Solder Receptacle Installed (LED or Incandescent Lamp)



MML43 Indicators

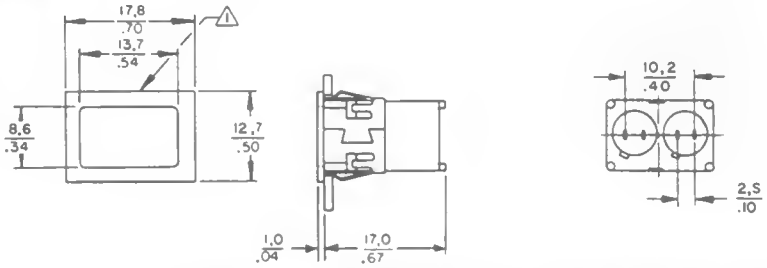


Terminal Detail

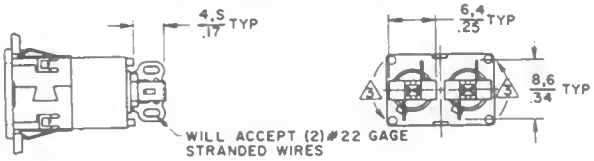


Notes:
1 MICRO SWITCH Identification This Side
2 – Linear measure mm/IN. or mm/IN.

MML46 Indicators



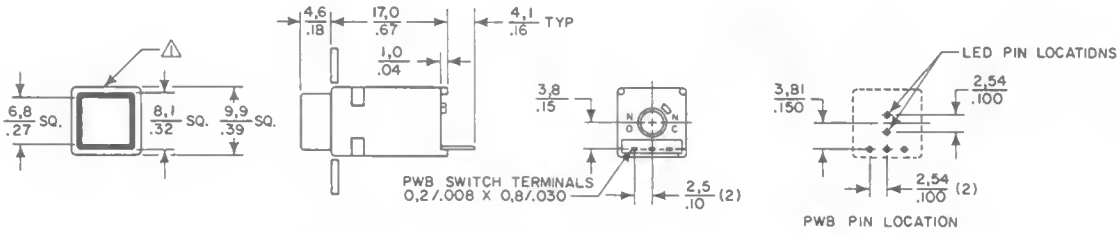
Solder Receptacle Installed (LED or Incandescent Lamp)



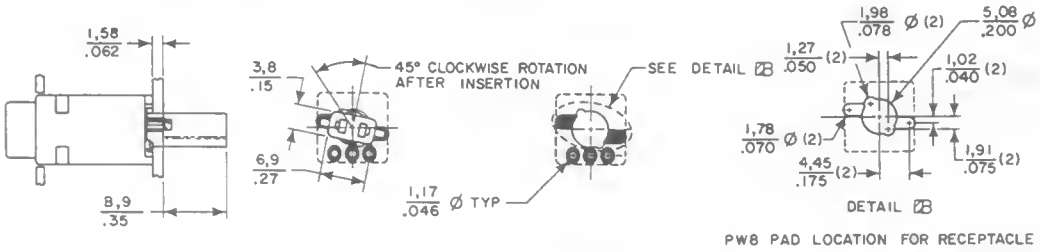
MOUNTING DIMENSIONS (For reference only)

PRINTED WIRING BOARD MOUNT PUSHBUTTON SWITCHES AND INDICATORS/SQUARE TYPE

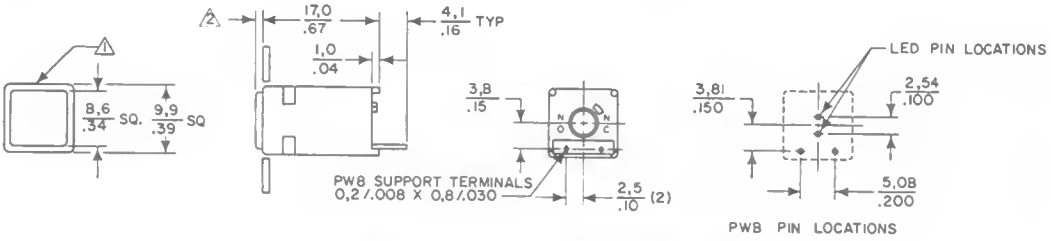
MML21 Switches



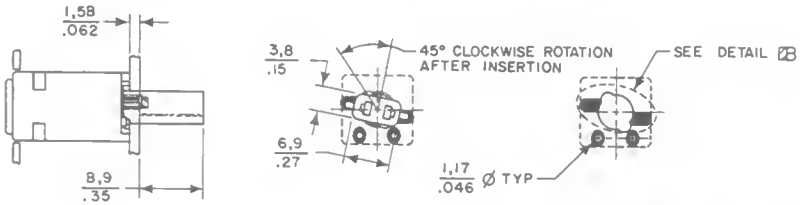
PWB Receptacle Installed (LED or Incandescent Lamp)



MML46 Indicators



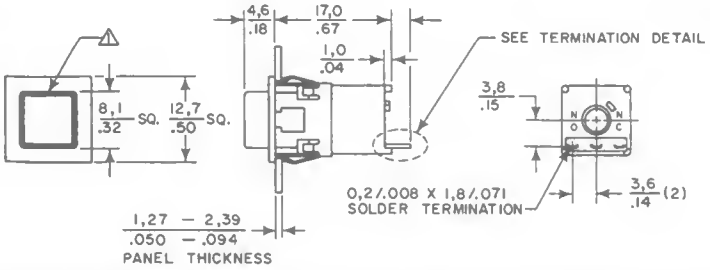
PWB Receptacle Installed (LED or Incandescent Lamp)



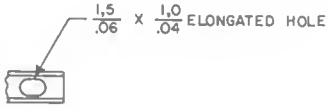
NOTES
⚠ MICRO SWITCH IDENTIFICATION THIS SIDE
⚠ MML41: 2,0/.08
MML46: 1,0/.04
3–LINEAR MEASURE mm/IN OR mm/IN

PANEL MOUNT PUSHBUTTON SWITCHES/SQUARE TYPE

MML21 Switches



Termination Detail



NOTE:
To install LED or lamp, use MML93L receptacle shown on page 88.

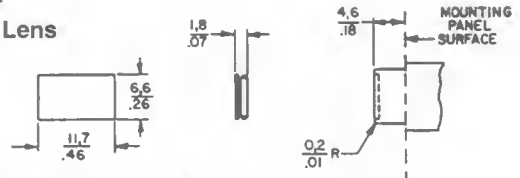
Manuals

Manual Switches
Miniature Manual Line

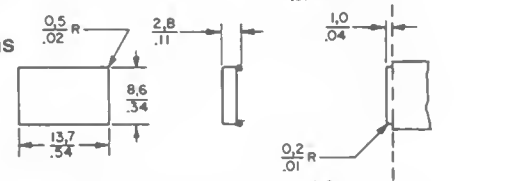
MOUNTING DIMENSIONS (For reference only)

LENSES

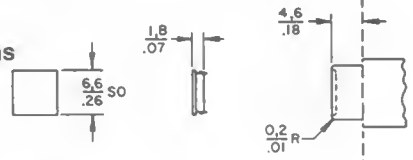
Rectangular Pushbutton Lens



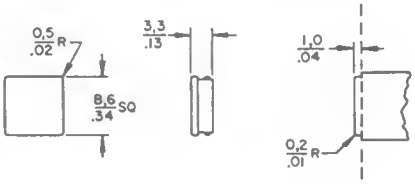
Rectangular Indicator Lens



Square Pushbutton Lens

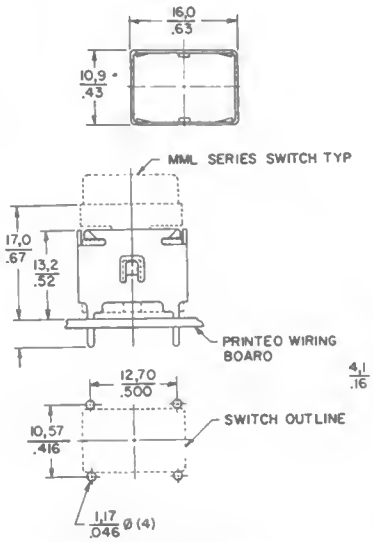


Square Indicator Lens



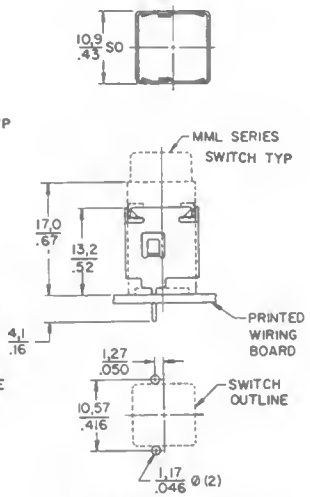
PWB SUPPORT BRACKETS

Rectangular



RECOMENEOED PRINTEO WIRING BOARD LAYOUT

Square



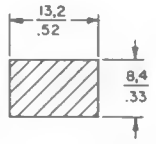
RECOMMENDED PRINTED WIRING BOARD LAYOUT

Manual Switches

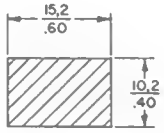
Miniature Manual Line

MOUNTING DIMENSIONS (For reference only)

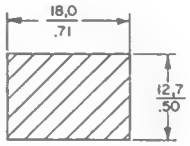
PANEL CUTOUTS FOR PWB MOUNT PADDLE AND ROCKER SWITCHES



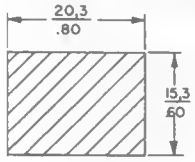
Actuator Thru Panel



Housing Thru Panel



2-Pole MML33, 34 Actuator

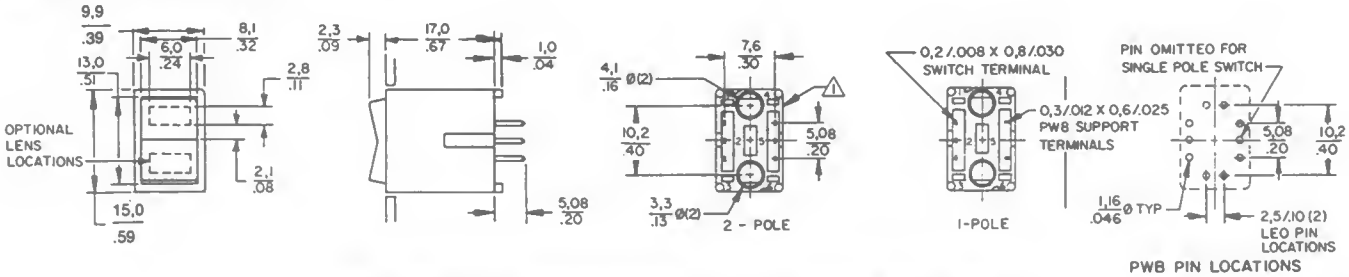


2-Pole MML33, 34 Thru Panel

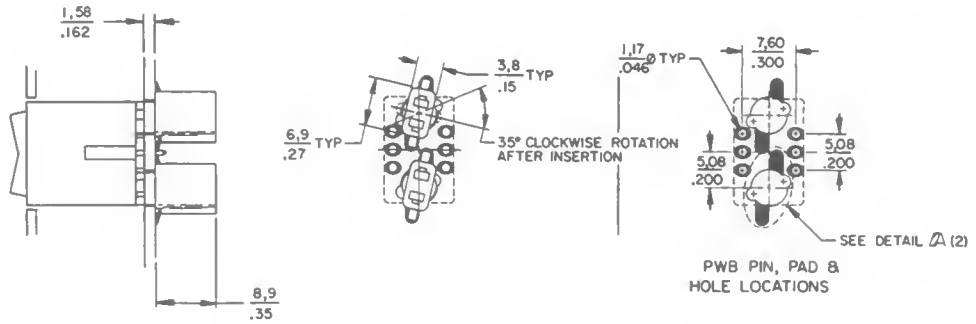
Housing Thru Panel

See page 91 for panel punch manufacturer.

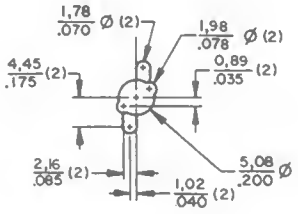
MML24 Rocker Switches



With PWB Receptacle Installed (LED or Incandescent Lamp)



Notes:
⚠ MICRO SWITCH Identification This Side
2 – Linear measure mm/IN. or mm/IN.



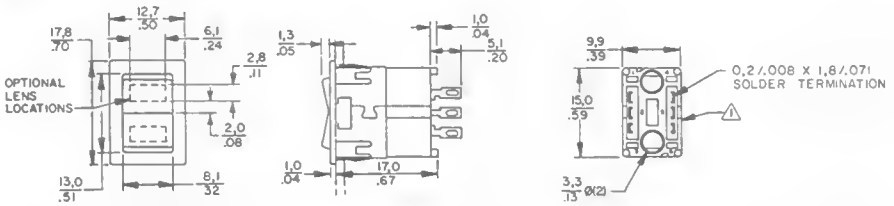
DETAIL A

PWB PAD LOCATION FOR RECEPTACLE

MOUNTING DIMENSIONS (For reference only)

PANEL MOUNT ROCKER SWITCHES

MML24 Rocker Switches

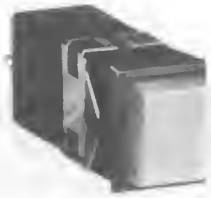


Notes:
⚠ MICRO SWITCH Identification This Side
2 – Linear measure mm/IN. or mm/IN.

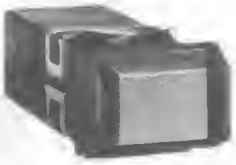
NOTE:
To install LED or lamp, use MML93R receptacle shown on page 87.

Manual Switches

Pushbutton Switches and Indicators

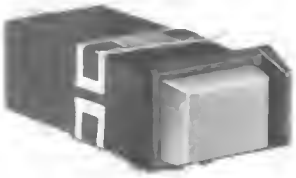


Bezel on all sides

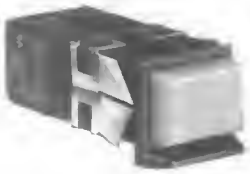


Barriers on short sides

Barriers on long sides



Barrier on one short side



Barriers on one long side

FEATURES

- Provides distinctive color display whether lighted or unlighted.
- Convenient front panel mounting and relamping, without tools.
- Matching indicators.
- Locked button option discourages tampering.
- Choice of transmitted color, projected color, or dead front display.
- UL recognized, CSA certified.

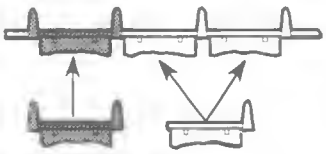
MOUNTING

Snap-in mounting. Switch or indicator is easily inserted into the cutout. Mounting clips grip the panel. No tools are needed.

Housings with a full bezel can be front panel or sub-panel mounted, individually or in strips.

Barrier type housings are normally mounted top-of-panel in strips, but can also be individually mounted. Barriers can be on either the short or long housing sides.

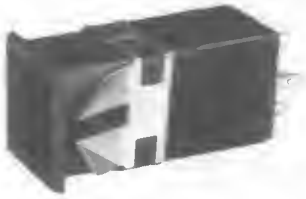
The drawing shows how housings with a barrier on one side are used in a strip of two or more units. The first has a barrier on two sides, while all other units have a barrier on one side, and butt against each other.



Barriers on both sides. Barriers on one side.

Button

Incandescent Lamp



Housing

RELAMPING

1. Lamps and legends can be changed from panel front. When button is removed, lamp is extracted from its socket and retained in button.

2. Ease of lamp replacement. After the inoperative lamp is automatically removed with the button, the new lamp is inserted without the use of tools.

ELECTRICAL RATINGS

5-amp silver contacts —
5 amps res., 3 amps ind., 30 VDC.
UL code L-4: 5 amps, 250 VAC

10-amp silver contacts —
UL code L-285; 10 amps, ⅙ Hp, 125 or 250 VAC.

Gold contacts —
1 amp res., 0.5 amp, ind., 30 VDC
UL code L-22: 1 amp, 125 VAC

Gold alloy contacts —
0.1 amp, res., 30 VDC;
1 amp, 125 VAC.

LOCKED BUTTON OPTION

Series 4 can be furnished with a locked button option for use in areas accessible to the public, where tampering and vandalism are problems. The housing has a special mounting clip with built-in button retainer. This mounting clip must be removed from behind panel to allow button removal. Button movement during switch operation is unaffected by locked button feature. (These units cannot be relamped from front of panel.)

Manual Switches

Pushbutton Switches and Indicators

SWITCH HOUSING ORDER GUIDE

Order buttons separately from page 109.

4A11B

Switch Housing Style (Black)
4A11B Bezel: all sides Mtg. clips: long sides
4A34B Barrier: one long side Mtg. clips: short sides
4A21B Barriers: short sides Mtg. clips: long sides
4A23B Barrier: one short side Mtg. clips: long sides
With Housing Provision for Locked Button
4A13B Bezel: all sides Mtg. clips: long sides
4A25B Barriers: short sides Mtg. clips: long sides
4A26B Barrier: one short side Mtg. clips: long sides

AA

Switching Element		
		Terminals
Electrical Data	Action	.110 QC
1-Pole (SPDT), 5 a. silver contacts	Momentary	AA
	Alt. Action	BA
2-Pole (DPDT), 5 a. silver contacts	Momentary	EA
	Alt. Action	FA
2-Pole (DPDT), 10 a. silver contacts	Momentary	NA
	Alt. Action	PA

11

Incandescent Illumination
11 No lamp, has lamp socket for T-3¼ wedge base lamps.
21 #161 12-volt T-3¼ lamp.
31 #656 or 152 28-volt T-3¼ lamp
91 Unlighted, no lamp socket.

Example:
4A11BAA11
Black switch housing with a bezel on all sides, mounting clips on long sides, 1-pole momentary-action 5-amp silver contacts, 110″ quick-connect/solder terminals, and a T-3¼ lamp socket.

MOUNTING CLIP ORIENTATION

Mounting clips on the **long sides** of the housing are specified when individually mounted or when the long sides of strip mounting housings parallel the long sides of the panel cutout slot. The most secure mounting is achieved when the mounting clips are on the long sides.

Mounting clips on the **short sides** of the housing are specified when short sides of strip mounted housings parallel the long sides of the panel cutout slot.

Manual Switches

Pushbutton Switches and Indicators

BUTTON ORDER GUIDE

4B1

Button With Metal Shell*

4B2
Both button and metal shell provided.

Button With Metal Shell, With Provision for Locked Button*

4B3
Both button and metal shell provided.

Button Without Metal Shell

4B1
Button only. (without metal shell). For replacement purposes only.

A

Button Type

A
Transmitted color.
5 sides lighted.
1-piece translucent button.

E
Transmitted color.
5 sides lighted.
Transparent colorless button & translucent color insert.
U or N type only.

G

Display Color

B
Std. Blue

G
Std. Green

R
Std. Red

Y
Std. Yellow

W
Std. White

N

Legend (Legend Order Sheet must accompany all orders for legended buttons)

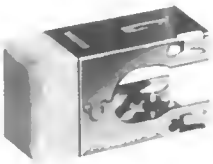
U
No legend, button (incl. insert) unassembled.
(For customer who does own legending.)
Use with any button except 4B1A—

N
No legend, button assembled.
(For applications not requiring legends.)
Use with any button.

L
Legend on button only, button assembled.
(For customer who prefers to have MICRO SWITCH provide legending.)
Use with "A" button.

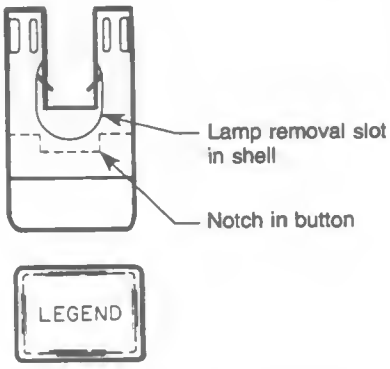
*To be ordered with switch.

Button



Button and metal shell

Example:
4B1AGN
Green (transmitted color) unlegended button. (If the button shell is also desired, substitute 4B2 for 4B1.)



Note: legended button should be assembled as shown above, with button notch keyed to lamp removal slot in shell. This will reduce possibility of lamp droppage when button is removed from the housing. Buttons are legended in this manner.

LEGENDING

Pad printed legends
Use Legend Order Sheet FO-63039 (see page 110) to specify pad printed legends. Reproduce it on your office copier. Legends are oversprayed for maximum durability.

Film legends
Film legends are not supplied by MICRO SWITCH. However, this service is readily available from commercial sources or may be provided through your in-house capabilities. The film should be polyester to withstand lamp heat and must be precision cut, per the dimensions shown on the next page, to insure proper alignment.

The film fits into a small undercut on the face of the button insert. The film is held securely when the outer button and insert are snapped together. (Note: It is difficult to disassemble for legend changes without damaging the parts.)

Button and insert should be snapped together prior to being assembled to the button shell.

LAMP ORDER GUIDE

Catalog Listing	Illum. Code	Incandescent Lamp Description
4Z231	31	#656 or #152 28-volt (T-3¼)

LAMP DATA

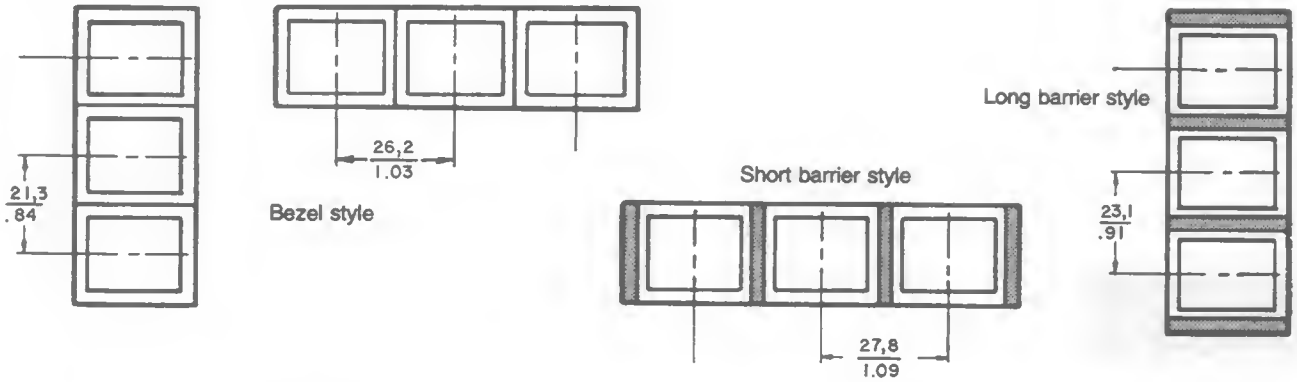
Following data was compiled from manufacturers' specifications and is provided for reference only.

Illum. Code	Industry Lamp No.	Design Volts	Incandescent Lamp Specifications			
31	656 or 152	28	Socket volts	28.0	27.0	26.0
			Amps	.06	.057	.054
			MSCP	.65	.52	.49
			Life (hrs. avg.)	5,000	7,500	10,000

METAL SHELL ORDER GUIDE

Catalog Listing	Description
4Z41	For type 4B1 buttons

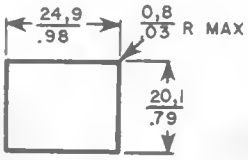
MOUNTING CENTERS FOR STRIP MOUNT



PANEL CUTOUT FOR STRIP MOUNT

	Housing Style	Dimensions +0,38 +.015 −0,00 −.000	
		Width	Length
Short Sides Abutting	Full Bezel	79" (20,1 mm)	[No. of units x 1.03" (26,2 mm)] - .05" (1,4 mm)
	Short Barrier	79" (20,1 mm)	[No. of units x 1.09" (27,8 mm)] - .12" (3,0 mm)
Long Sides Abutting	Full Bezel	.98" (24,8 mm)	[No. of units x .84" (21,3 mm)] - .05" (1,4 mm)
	Long Barrier	.98" (24,8 mm)	[No. of units x .91" (23,1 mm)] - .12" (3,0 mm)

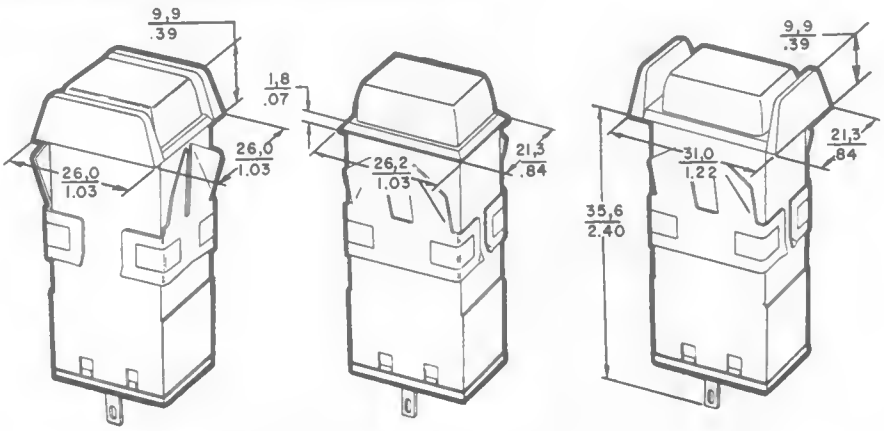
PANEL CUTOUT FOR INDIVIDUAL MOUNT (any housing style)

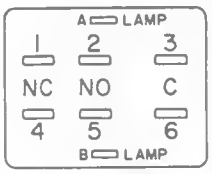


Manual Switches

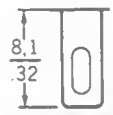
Pushbutton Switches and Indicators

MOUNTING DIMENSIONS (For reference only)

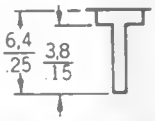




⚠ **Terminal View**



.110 QC terminal



Printed circuit terminal

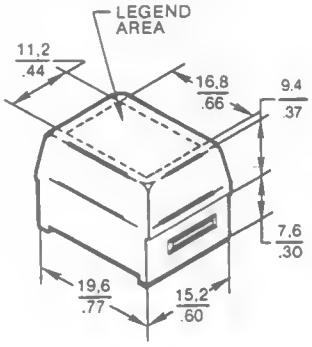
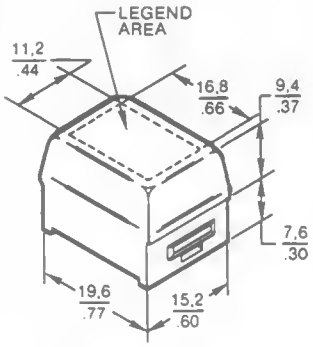
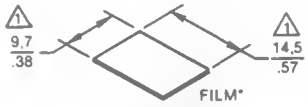
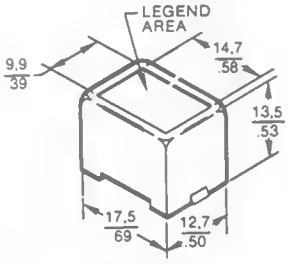
Panel thickness: .040-.200 in. (1,02-5,08 mm)

Key: 0,0 = mm / 0.00 = inches

⚠ For proper legend orientation, Series 4 switch when viewed from front of panel, should have terminals 1 and 3 up for Figures 1 & 3 and to the right for Figures 2 and 4. (Figures 1-4 on Legend Order Sheet next page.)

Quick-connect terminals are .110" (2,8 mm) wide by .020" (0,5 mm) thick. The slot is .130" (3,3 mm) long by .048" (1,2 mm). Printed circuit terminals are: Lamp — .025 (0,6 mm) by .020" (0,5 mm): Switch — .025" (0,6 mm) square.

All terminals are plated to permit soldering.

Type A Button (5 sides lighted)	Type E Button (5 sides lighted)
 Translucent Colored Button	 Transparent Button Colorless   Translucent Colored Insert ±.005/0,13 *Thickness: .004" to .007"/0,1 to 0,18 (Film furnished by customer)

Pushbuttons

Honeywell

"Series 4" Legend Order Sheet

ACCOUNT NO. _____

1. Determine if legend is to be applied to outer button shell, or to button insert.
2. Select appropriate Fig. No. from Chart "A" or "B", and enter on legend order chart.
3. Place√ in appropriate "TYPE SIZE" column *(refer to CHART "C" for examples).*
4. Place√ in BLACK or WHITE legend color column.
5. Indicate quantity desired.
6. Fill in legend description. *(DO NOT EXCEED MAXIMUM NUMBER OF LINES OR*

Catalog Listing 4		
Customer P.O. No.	Customer Dwg. No.	
MICRO SWITCH Sales Order	Line Number	Schedule No.

Customer: _____

Address: _____

(state) (city)

A Button: Legend on Top Surface

LegendArea	Type Size	Fig. 1 Without An "M" or "W" Max. Char. /Line	Fig. 1 Without An "M" or "W" Max. Lines /Area	Fig. 1 With An "M" or "W" Max. Char. /Line	Fig. 1 With An "M" or "W" Max. Lines /Area	Fig. 2 Without An "M" or "W" Max. Char. /Line	Fig. 2 Without An "M" or "W" Max. Lines /Area	Fig. 2 With An "M" or "W" Max. Char. /Line	Fig. 2 With An "M" or "W" Max. Lines /Area
Fig. 1	5/64	9	4	9	4	7	5	6	5
	7/64	7	3	6	3	5	4	4	4
	9/64	6	2	5	2	4	3	4	3
	13/64	4	1	3	1	3	2	2	2
Fig. 2	5/16	2	1	2	1	2	1	1	1

B Button Insert: Legend on Top Surface

LegendArea	Type Size	Fig. 1 Without An "M" or "W" Max. Char. /Line	Fig. 1 Without An "M" or "W" Max. Lines /Area	Fig. 1 With An "M" or "W" Max. Char. /Line	Fig. 1 With An "M" or "W" Max. Lines /Area	Fig. 4 Without An "M" or "W" Max. Char. /Line	Fig. 4 Without An "M" or "W" Max. Lines /Area	Fig. 4 With An "M" or "W" Max. Char. /Line	Fig. 4 With An "M" or "W" Max. Lines /Area
Fig. 3	5/64	7	3	7	3	4	4	4	4
	7/64	5	2	5	1	3	3	3	3
	9/64	5	1	5	1	3	2	2	2
	13/64	3	1	2	1	2	2	1	2
Fig. 4	5/16	2	1	1	1	1	1	1	1

C

Modified Gothic lettering (A thru Z). numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, 13/64 and 5/16.

A3
Modified Gothic

STANDARD SYMBOLS AVAILABLE

.	,	:	;	!	?	'	_	"	/	(	)	*	&
$	¢	#	%	°	+	-	±	÷	x	=	≠	>	<
→	↑	↓	←	CR	1/4	1/2	3/4	1/3	2/3	@	∞		

D

SPECIAL LEGENDS

NOTE: Use this area to show special Legend Locations or Configurations NOT shown above. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A"

Fig. "B"

LEGEND ORDER CHART

Customer Part No	Fig No	Type Size REF. Chart A or B 5/64	7/64	9/64	13/64	5/16	Ink Color Black	White	Button Qty	Legend Description Do Not Exceed Maximum Number of Lines or Characters Sequence: Left-to-Right or Top-to-Bottom 1st Line	2nd Line	3rd Line	4th Line	5th Line

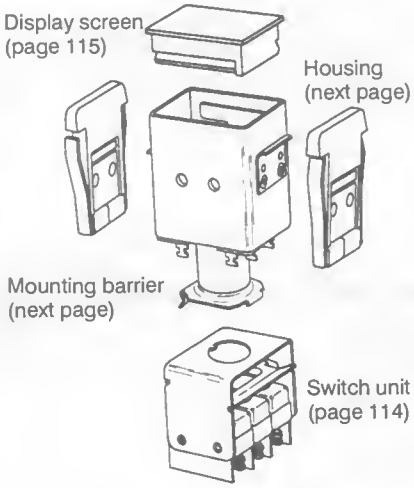
FO-63039-B

_____ (Signature) _____ (Date)

Manual Switches

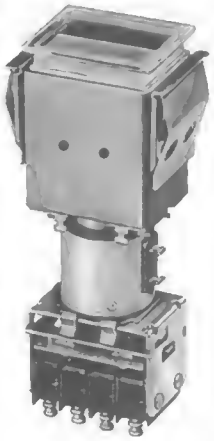
Pushbutton Switches and Indicators

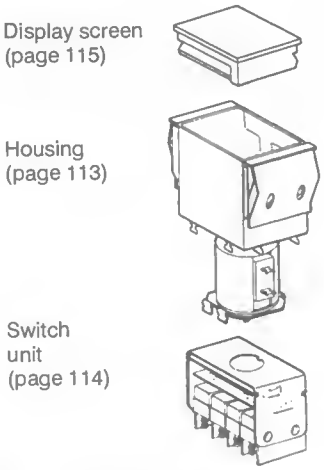
BARRIER MOUNT



Mounting barriers attach to either the long or short sides of the housing. They have spring clips which grip the panel. Mounting barriers also separate display screens to protect against inadvertent operation. Multiple units can be attached together in a strip and snapped into a panel slot; or they can be mounted individually.

FLANGE MOUNT





Flange mount units have mounting clips ready-attached to the housing. They can be individually installed or replaced; and enable use of an overlay panel, if desired. Groupings can be separated by optional spacing barriers.

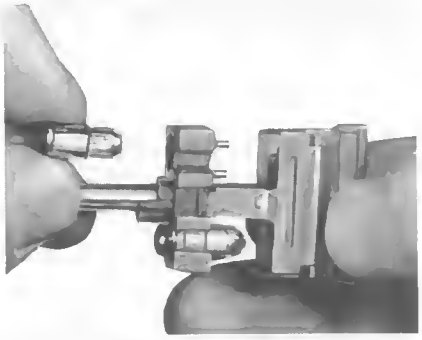
MODULES ASSEMBLE EASILY

All modules are ordered as separate items which snap together for easy assembly.

FEATURES

- Easy-to-assemble modules provide thousands of display/control combinations
- Up to 4 incandescent lamps
- 1, 2, 3, or 4-section display
- Transmitted or projected color
- Integral hold-in coil option provides remote released contacts. Pull-in coils (flange mount only) enable remote actuation
- Switch guard accessory.

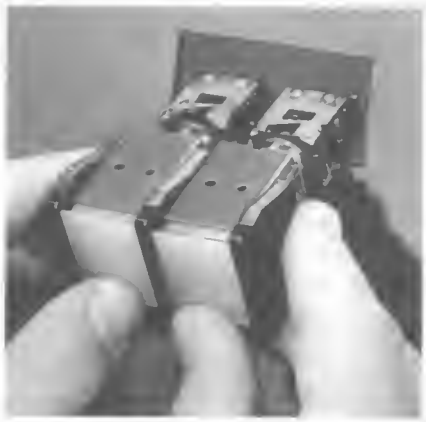
CHANGE LAMPS OR FILTERS FROM PANEL FRONT



Without tool. Remove display screen/lampholder assembly from 2C200 operator-indicator (or 2F200 indicator). Unit is keyed to maintain proper orientation when replacing. Use only flange base T-1¾ lamps with 2C200 and 2F200 devices.

LAMPS AND FILTERS

Order lamps and filters for projected color from page 111.



BARRIER MOUNT MODULES

Barrier mount assemblies are identical in panel appearance. Operator-indicator housings have spring clips for attaching switch modules. This feature is not provided with indicator housings.

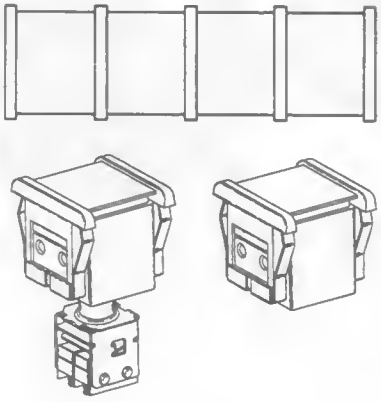
Barriers are necessary for mounting. They can be specified for attachment to the long or short side of the housing, as stated in the order guides.

BARRIER MOUNT HOUSING ORDER GUIDE

See "Application Data" for typical bailing circuits for coil-equipped modules.

Barriers Attach On:	No. of Lamp Sockets	Tool Not Required Operator-Indicator	Tool Not Required Indicator Only
Long Sides of Housing	2 (A & C) 4 (A-D)	2C207 2C209	
Short Sides of Housing	2 (A & C) 4 (A-D)	2C201 2C203	2F203

Barriers on long sides



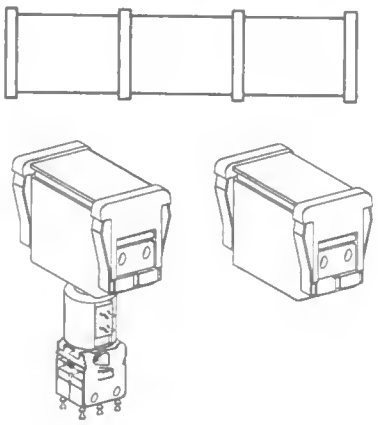
MOUNTING BARRIER ORDER GUIDE

For strip mounting, specify one more barrier than the number of units in the group.

Mounting Barrier Type	For Panel Thickness	Catalog Listings Gray	Catalog Listings Black
Attach to Long Sides	.06-.19 in. (1,52-4,83 mm)	2B2	2B4
Attach to Short Sides	.06-.19 in. (1,52-4,83 mm)	2B1	2B3

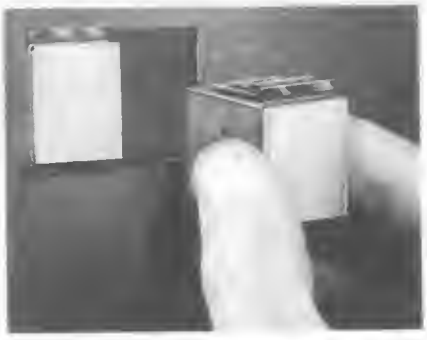
Note: Panels .19 in. (1,52 mm) thick require the .06-.19 in. (1,52-4,83 mm) type barriers.

Barriers on short sides

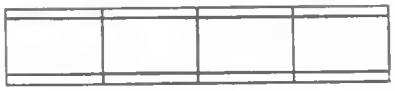


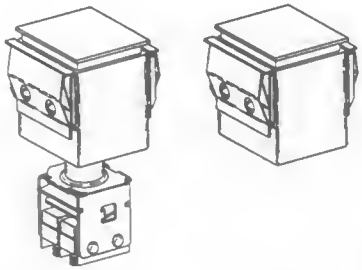
Manual Switches

Pushbutton Switches and Indicators



Flanges on long sides





FLANGE MOUNT MODULES

Flange mount assemblies are identical in panel appearance. Operator-indicator housings have spring clips for switch modules attachment (not provided with indicator housings).

Barriers are not required, since the panel mounting clips are ready-attached to flange sides of the housings. However, spacing barriers can be used for color-coding. They also aid in preventing inadvertent operation of two screens with one push.

Mounting dimensions on page 114.

FLANGE MOUNT HOUSING ORDER GUIDE

See "Application Data" for typical bailing circuits for coil-equipped modules.

Flanges On:	No. of Lamp Sockets	Tool Not Required	
		Operator-Indicator	Indicator Only
Long Sides of Housing	2 (A & C) 4 (A-D)	2C204 2C206	2F206

SPACING BARRIER ORDER GUIDE

For .06-31 in. (1,5-7,9 mm) thick panels.

Spacing Barrier Type	Catalog Listings	
	Gray	Black
For Long Flange Housing	2B9	2B18

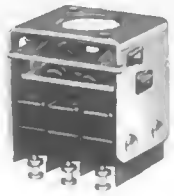
Manual Switches
Pushbutton Switches and Indicators

SWITCH MODULES

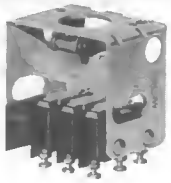
Interchangeable type 2D switch modules attach to spring clips on the bottom of operator-indicator housings. There is a wide selection of circuitry, electrical ratings, operating actions and terminations.

For mounting dimensions, see page 115.

SM SUBMINIATURE MULTI-SPDT SWITCH MODULES



Momentary action



Alternate action

SM switch modules offer a choice of two momentary action styles, one with a pronounced touch-feedback, the other with low operating force for rapid repeat actuation. Also available with alternate-action and combination momentary/alternate action modules. Extra length turret solder terminals.

ELECTRICAL RATING

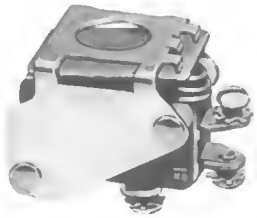
Silver contacts:
30 VDC: 5 amps res. sea level or 50,000 ft, 3 amps ind. sea level, 2.5 amps 50,000 ft. Max. inrush, 24 amps.
UL and CSA rating for basic switch: 5 amps, 125 or 250 VAC.

Gold contacts:
30 VDC: 0.5 amp ind., 1 amp res., sea level and 50,000 ft. Max. inrush, 2 amps.

SM SWITCH MODULE ORDER GUIDE

No. of SPDT Circuits	Momentary Action Touch-Feedback Type Silver Contacts	Alternate Action Low Force Type Silver Contacts
1	2D100	2D118
2	2D2	2D26
4	2D9	2D33

V3 COMPACT SPDT/DPDT SWITCH MODULES



V3 switch modules have screw terminals with lockwashers. Quick-connect terminals (not shown) are also available. When used with short-flange operator indicators, add spacing barriers to prevent interference.

ELECTRICAL RATING

30 VDC: 10 amps ind.* sea level, 6 amps ind.,* 50,000 ft. Motor load, 6 amps.** UL and CSA rating for basic switch: 10 amps, ⅓ Hp, 125 or 250 VAC; ½ amp, 125 VDC; ¼ amp, 250 VDC.

* Inductive currents in accordance with AN3179.
** Motor load rating based on starting current.

V3 SWITCH MODULE ORDER GUIDE

No. of SPDT Circuits	Momentary Action
1	2D70
2	2D72

Manual Switches

Pushbutton Switches and Indicators

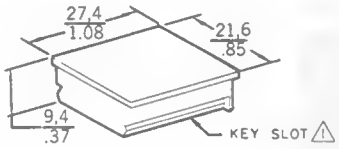
ONE-PIECE DISPLAY SCREEN OPTIONS

Single-section

These translucent solid color display screens are single-section/one piece construction

SINGLE-SECTION/ ONE-PIECE SCREENS ORDER GUIDE

	Standard
Red	2A1
Yellow	2A2
Green	2A3
White	2A5



⚠ KEY SLOT FACES SIDE OF HOUSING SHOWING CATALOG LISTING (ABOVE LAMP TERMINALS "A" AND "B")

THREE-PIECE DISPLAY SCREEN OPTIONS

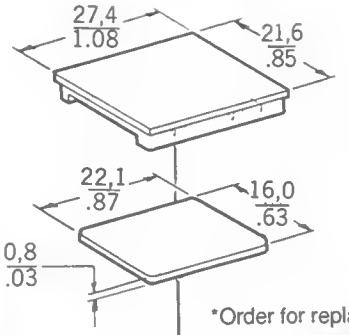
Single-section

These screens have transparent colored or colorless caps, transparent colorless legend inserts and translucent colored bases.

SINGLE-SECTION/THREE-PIECE SCREENS ORDER GUIDE

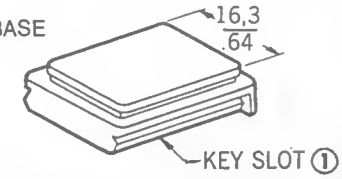
Color	Colorless Caps
Red	2A81
Yellow	2A82
Green	2A85
White	2A70
Amber	2A114

NOTE:
Add **–L** to catalog listing if button is to be legended.



*Order for replacement only

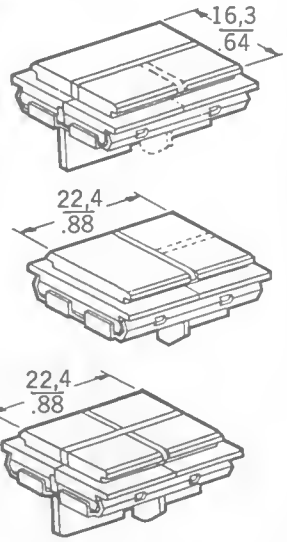
BASE



① Key slot faces side of housing showing catalog listing (above lamp terminals "A" and "B")

TWO, THREE AND FOUR-SECTION DISPLAY SCREENS

Dotted lines show 3-section base configuration



Silicone rubber baffles prevent light spillage from one section to another. Screen caps and legend inserts are transparent colorless. Bases are translucent colored.

For more information on 2, 3, and 4-section display screens, contact the MICRO SWITCH Application Center.

Honeywell

SERIES 2A, 2L, and 2W
LEGEND ORDER SHEET/PRODUCT SPECIFICATION

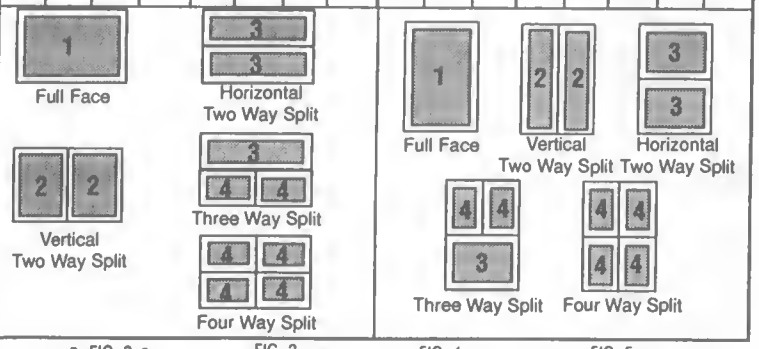
FO-62308-H

ACCOUNT NO. 126-284

1. Complete ORDER SHEET for EACH NEW or REPEAT ORDER. *Pg* ____ *of* ____
2. For each different legend, fill in e Diagram below as follows:
   a. Determine proper oreintation of the legend (HORIZONTAL or VERTICAL).
   b. For SPLIT SCREEN ORDER, drew line(s) to show where the split occurs and indicate BASE COLOR for each section.
   c. PRINT or TYPE the required legend in the diagrams provided.
   d. Fill in QUANTITY and FIGURE NO, in the columns to the right.
   e. Indicate keyed corner on all 2L listings.

Form No Shaded Area	HORIZONTAL								VERTICAL							
	1		2		3		4		1		2		3		4	
TYPE SIZE	MAX. CHAR /LINE	MAX. LINES /AREA	MAX. CHAR. /LINE	MAX. LINES /AREA	MAX. CHAR /LINE	MAX. LINES /AREA	MAX. CHAR /LINE	MAX. LINES /AREA	MAX. CHAR. /LINE	MAX. LINES /AREA	MAX. CHAR. /LINE	MAX. LINES /AREA	MAX. CHAR. /LINE	MAX. LINES /AREA	MAX. CHAR. /LINE	MAX. LINES /AREA
5/64	12	5	6	5	12	2	6	2	8	6	4	6	8	3	4	3
7/64	9	4	4	4	9	2	4	2	6	5	3	5	6	2	3	2
9/64	7	3	3	3	7	1	3	1	5	4	2	4	5	2	2	2
13/64	5	2	2	2	5	1	2	1	3	3	1	3	3	1	1	1
5/16	3	1	1	1	3	1	1	1	2	2	1	2	2	1	1	1

LEGEND AREAS



D FIG. 1 C ___ VERT. HORZ.	D FIG. 2 C ___ VERT. HORZ.	D FIG. 3 C ___ VERT. HORZ.	D FIG. 4 C ___ VERT. HORZ.	D FIG. 5 C ___ VERT. HORZ.
D FIG. 6 C ___ VERT. HORZ.	D FIG. 7 C ___ VERT. HORZ.	D FIG. 8 C ___ VERT. HORZ.	D FIG. 9 C ___ VERT. HORZ.	D FIG. 10 C ___ VERT. HORZ.

Catalog Listing		
Customer P.O. No.	Customer Dwg. No.	
MICRO SWITCH Sales Order	Line Number	Schedule No.

Customer: _____

Address: _____

(state) (city)

Quantity Ordered	Fig No.	Size	Ink Color BLK	Ink Color WHT	Customer Part Number

NOTE: Round, three and four-way splits are not available on 2W Series Display Screens. Only black and white type is available.

Modified Gothic lettering (A thru Z). numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, 13/64 and 5/16.

A3
Modified Gothic

STANDARD SYMBOLS AVAILABLE

.	,	:	;	!	?	'	_	"	/	(	)	*	&	
$	¢	#	%	°	+	-	±	÷	x	=	≠	>	<	
→	↑	↓	←	CR	1/4	1/2	3/4	1/3	2/3	@	∞			

(Signature) _____ (Date) _____

Manual Switches

Pushbutton Switches and Indicators

LEGEND INFORMATION

Honeywell MICRO SWITCH Division provides legend service on the inserts supplied with three-piece screens only. To specify your needs, add **-L** to the catalog listings (example: 2A81-L) and use Legend Order Sheet (Form FO-62308), shown on facing page. Reproduce it on your office copier.

On any one insert, only one size of type is provided in either black or white. After legending, the insert is assembled to the display screen. The type face used is "Modified Gothic".

LAMPS

T-1¾ incandescent lamps are available from MICRO SWITCH in 28 volt versions.

Use of neon lamps is not recommended. Light output is approximately 30% of an incandescent lamp. Also, a neon lamp will not illuminate blue or green filters or display screens due to the absence of these colors from the neon light spectrum.

LAMP POLICY

The 28 volt lamps are offered as a convenience to customers. Honeywell MICRO SWITCH Division does not extend any warranty as to such lamps, and cannot guarantee to provide lamps from specific manufacturers. Any technical or quality questions regarding such lamps should be directed to the lamp manufacturer.

COLOR FILTERS FOR PROJECTED COLOR

Projected color is achieved by using white buttons and color filters over clear lamps. When lamps are lighted, white button takes on color projected by the filters.

Filters used with type 2C200 and 2F200 housings (no-tool relamping) slip over lamp sockets in lampholder.

SCREEN/LEGEND COLORS

The chart below shows recommended display screen and legend color combinations for optimum legibility.

Screen Color	Legend Lettering	
	Black	White
Red		x
Green		x
Yellow	x	
Amber	x	x
White	x	

LAMP ORDER GUIDE

Catalog Listing	Base Style	Type No.	Rating			Life/Voltage†	
			Volts	Amps	Life in Hours	Volts	Expected Life (Hrs.)
2E1	Flange	327	28	.040	1000	24.0 26.0 30.0	7,500 2,800 400

† These are experimental continuous life test results supplied by a lamp manufacturer for reference only. Intermittent operation may reduce these figures as much as 50%. Ratings are based on median values of current and life.

Wattage should not exceed 2.4 watts (2 lamps) per switch, for continuous illumination.

FILTER ORDER GUIDE

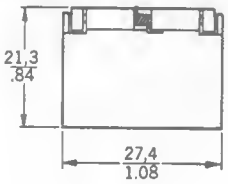
Filter Style	Red	Green	Amber	White*
For Type 2C200 and 2F200 Housings	2G12	2G14	2G16	2G17

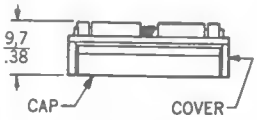
* Has blue tint to compensate for high yellow content of incandescent lamps at low voltages.

Manual Switches

Pushbutton Switches and Indicators

SWITCH GUARD ACCESSORY
A hinged cover on the switch guard helps avoid inadvertent operation of the display screen. It is installed in place of the transparent slide-on cap furnished with three-piece screen. Note: When used with pull-in coil devices, specify the 2C200 operator-indicator housings which have the no-tool relamping feature.





Key: 0,0 = mm / 0.00 = inches

Barrier mount assembly with guard installed. (Can also be used with all flange mount units.)

Guard requires a "lift-to-push" response to operate switch normally.

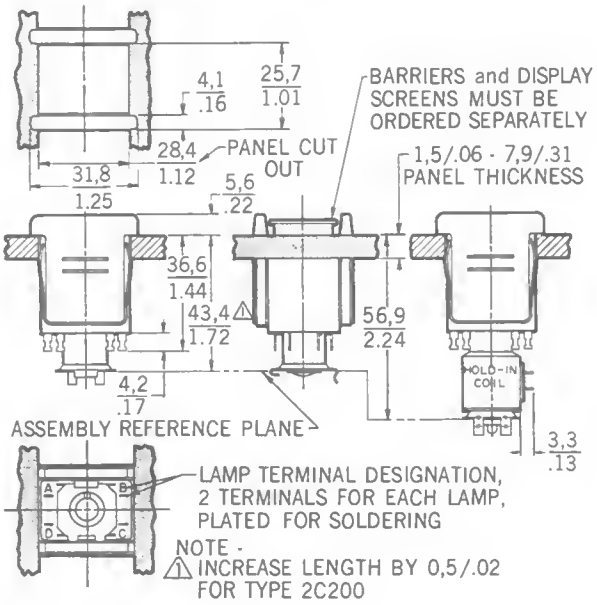
Order Catalog Listing **2H20**

Manual Switches

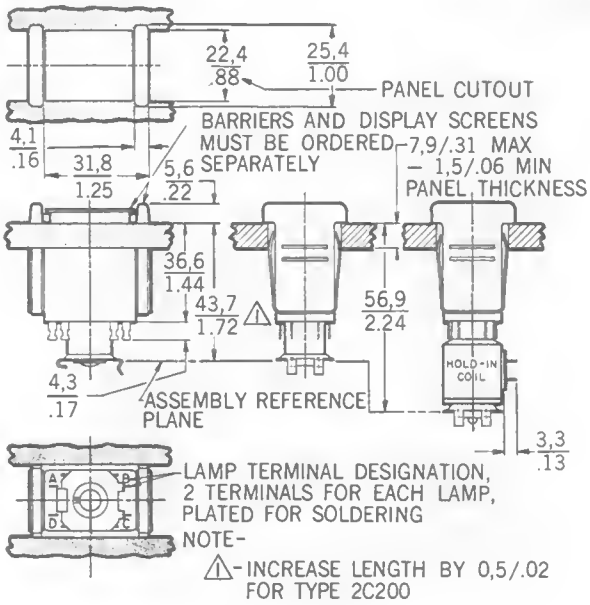
Pushbutton Switches and Indicators

MOUNTING DIMENSIONS (For reference only)

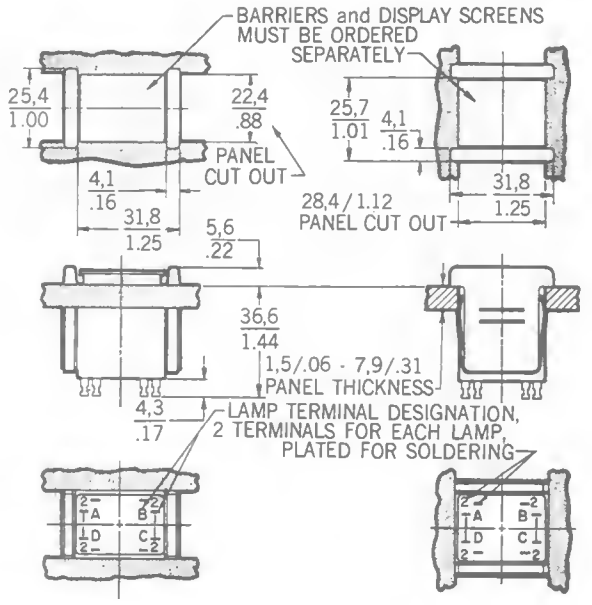
Long barrier operator-indicators



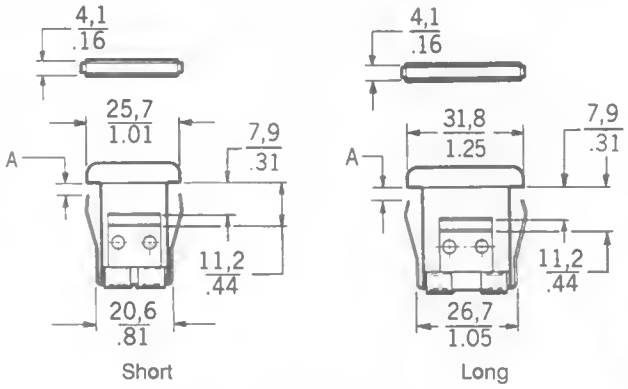
Short barrier operator-indicators



Short barrier indicators **Long barrier indicators**



Mounting barriers



Key: 0,0 = mm / 0.00 = inches.

A	Panel Thickness
1,5/.06 4,6/.18	1,5-4,81/.06-.19 4,8-7,9/.19-.31

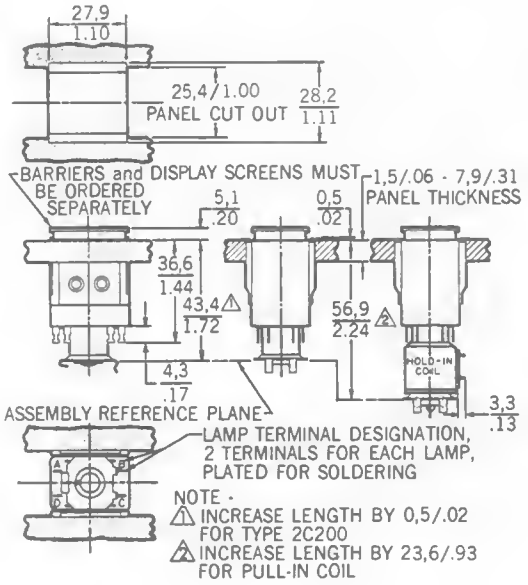
Length Of Panel Cutout*

Type of Indicator or Operator-indicator		Number of Units						
		1	2	3	4	5	6	7
Short Barrier	mm	36,09	68,00	99,87	131,72	163,60	195,48	227,36
	in.	1.421	2.677	3.932	5.186	6.441	7.696	8.951
Long Barrier	mm	30,00	55,78	81,58	106,34	133,12	159,90	184,68
	in.	1.181	2.196	3.212	4.226	5.241	6.256	7.271

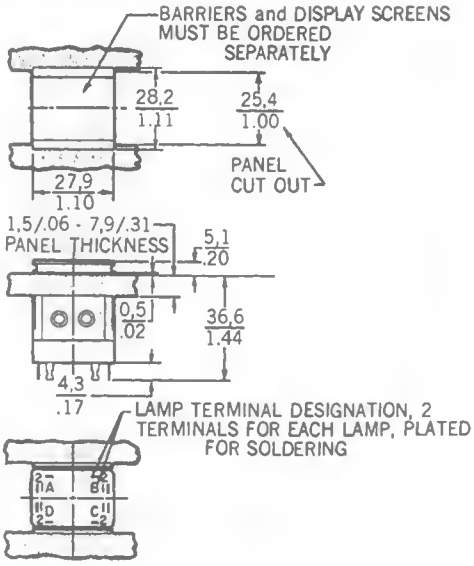
* Nominal dimensions, ±0,25 mm/0.10 in. (In 5% of the cases, the cutout will be undersized for the build-up of assembled units and will require enlargement.

MOUNTING DIMENSIONS (For reference only)

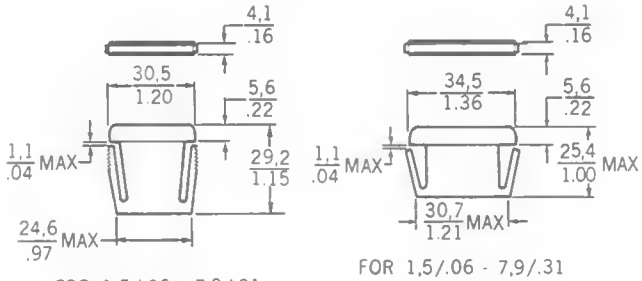
Long flange operator-Indicators



Long flange Indicators



Spacing barriers



FOR 1,5/.06 - 7,9/.31 PANEL THICKNESS
Short

FOR 1,5/.06 - 7,9/.31 PANEL THICKNESS
Long

Key: 0,0 = mm / 0.00 = inches.

Length Of Panel Cutout*

Add 4,19 mm/.165 in. to length for each optional spacing barrier used.

Type of Indicator or Operator-Indicator		Number of Units						
		1	2	3	4	5	6	7
Long Flange	mm	27,94	55,75	83,57	111,36	139,17	166,98	194,77
	in.	1.1	2.195	3.290	4.384	5.479	6.574	7.668

* Nominal dimensions, ±0,25 mm/0.10 in. (In 5% of the cases, the cutout will be undersized for the build-up of assembled units and will require enlargement.

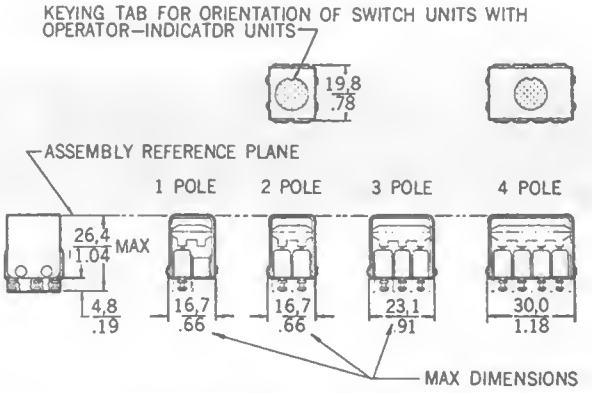
Manual Switches

Pushbutton Switches and Indicators

MOUNTING DIMENSIONS (For reference only)

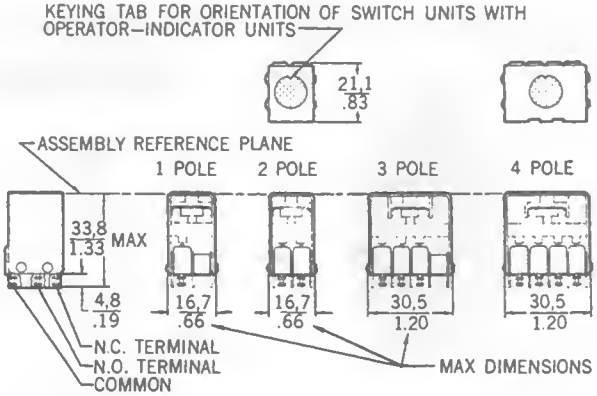
SM Switch Modules

Momentary



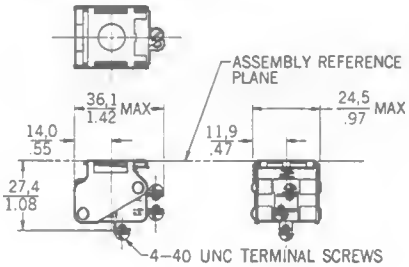
NOTE -
1–'T2' TERMINALS ARE PLATED FOR SOLDERING
2–SWITCHES DO NOT NECESSARILY OPERATE SIMULTANEOUSLY

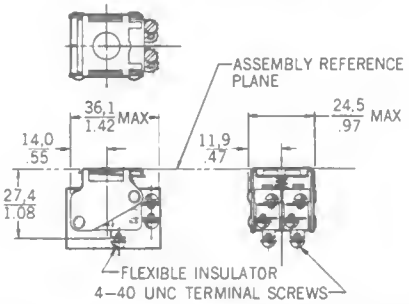
Alternate-Action



NOTE -
1–'T2' TERMINALS ARE PLATED FOR SOLDERING
2–SWITCHES DO NOT NECESSARILY OPERATE SIMULTANEOUSLY

V3 Switch Modules





FEATURES
- Compact size
- Up to 4-poles
- Sealed versions

TOUCH FEEDBACK SWITCHES

ORDER GUIDE
Momentary and alternate action switches.

Button Color	No. of SPDT Circuits 2 Mom. Action	2 Alt. Action	4 Mom. Action
Black	2PB11-T2	82PB19-T2	—
	2PB732-T2 (M8805/23-001)	—	4PB714-T2 (M8805/23-003)
Red	2PB12-T2	—	—
	2PB717-T2 (M8805/23-002)	—	—
Green	2PB273-T2	—	—

SHORT TRAVEL SWITCHES

ORDER GUIDE
Momentary action switches.

Button	No. of SPDT Circuits 2	3
Black	2PB7	3PB7

These switches resemble the touch-feedback design, but have a flexible leaf actuator for lower operating force and shorter button travel.

PANEL SEALED SWITCHES

An elastomer seal is bonded between actuating plunger and button collar. An O-ring seals the button assembly to the panel front.

Two-piece design enables button to be mounted separately. After switch unit is wired, it snaps into place from behind panel.

ORDER GUIDE
Momentary action switches.

Button Color	Collar Type	No. of SPDT Circuits 1	2
Black	Hex	1PB4	2PB4
Black	Round	1PB42	—
Red	Round	1PB43	—

ELECTRICAL RATINGS

(Except 15PB and 700PB)
30 VDC: 5 amps, res., sea level or 50,000 ft.; 3 amps, ind., sea level; 2.5 amps ind., 50,000 ft; 24 amps, max. inrush.
UL and CSA rating for basic switches: 5 amps, 125 or 250 VAC.

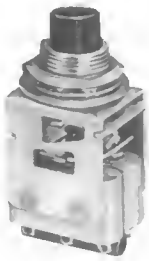
WATERTIGHT SWITCH

ORDER GUIDE
Momentary action switches.
Has knurled chrome-finished facenut.

Button Color	No. of SPDT Circuits 2
Black	2PB901-T2

Facenut-to-panel, button-to-facenut, and bushing-to-facenut, sealing helps prevent entry of water from behind panel, up and over bushing wall. Switch units potted in corrosion resistant metal enclosure. Meets submergence requirements of MIL-STD-108 (up to 10 PSI water pressure for one hour).

HERMETICALLY SEALED SWITCHES



These pushbuttons are equipped with HM hermetically sealed switch units, which have metal-to-metal fusion around the cover, actuator base, and mounting holes. Terminals are sealed glass-to-metal.

Vapor-proof construction enables use in damp locations without condensation on contacts. External parts corrosion resistant per MIL-S-8805. Meets explosion-proof requirements of MIL-S-8805.

ORDER GUIDE
Momentary action switches.

Button Color	No. of SPDT Circuits 2	4
Black	702PB1	704PB1

MINIATURE SIZE SWITCHES

1PB5

15PB2

ORDER GUIDE
Momentary action switches.

Button	No. of SPDT Circuits 1	2
Steel*	1PB5	—
White Plastic	—	15PB2

* Steel button enables use under hinged plates or paddle levers, in addition to manual operation.

ELECTRICAL RATINGS — 700PB and 15PB
700PB (With hermetically sealed switch units):
28 VDC and 115 VAC, 400 HZ: 3 amps, ind., 5 amps, res.

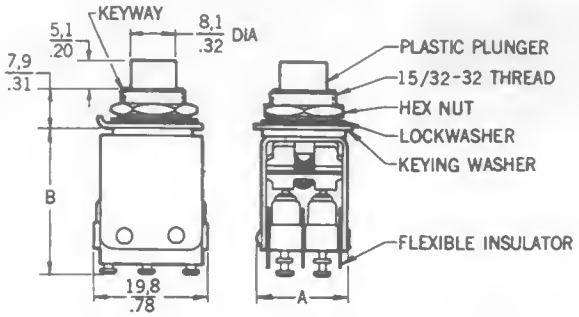
15PB:
30 VDC and 115 VAC: 2 amps, ind., 5 amps. res.; 1.0 amp, lamp load.

1PB5
250 VAC: 5 amps.

30 VDC: 5 amps, res., sea level or 50,000 ft.; 3 amps, ind., sea level; 2.5 amps ind., 50,000 ft.; 24 amps, max. inrush.

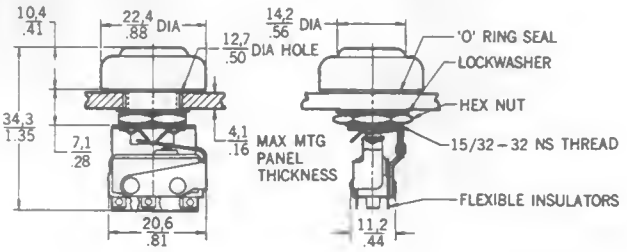
MOUNTING DIMENSIONS (For reference only)

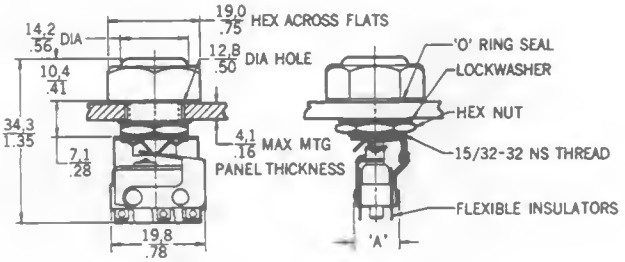
Touch Feedback Switches



		2-Pole	4-Pole
Dim. "A" (max.)	Mom.	16,8/.66	30,0/1.18
	Alt. Act.	17,3/.68	30,5/1.20
Dim. "B"	Mom.	26,7/1.05	26,7/1.05
	Alt. Act.	33,0/1.34	33,0/1.34

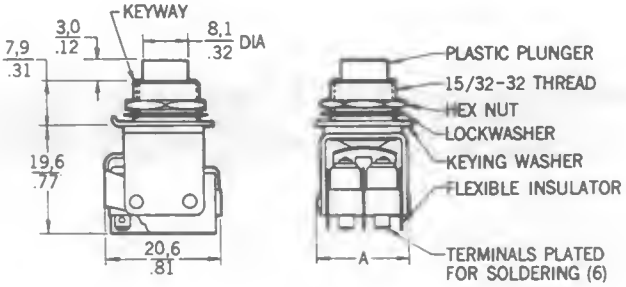
Panel Sealed Switches





	1-Pole	2-Pole
Dim. "A" (max.)	11,7/.46	17,0/.67

Short Travel Switches



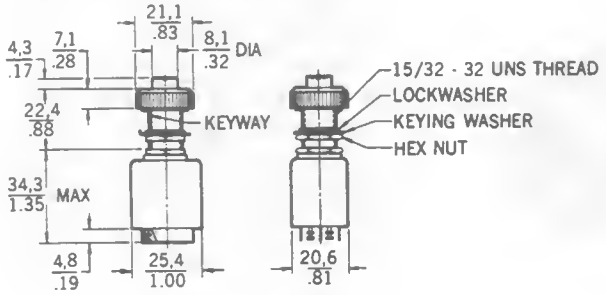
	2-Pole	3-Pole
Dim. "A" (max.)	17,0/.67	23,8/.94

Key: $\frac{0{,}0 = \text{mm}}{0.00 = \text{inches}}$

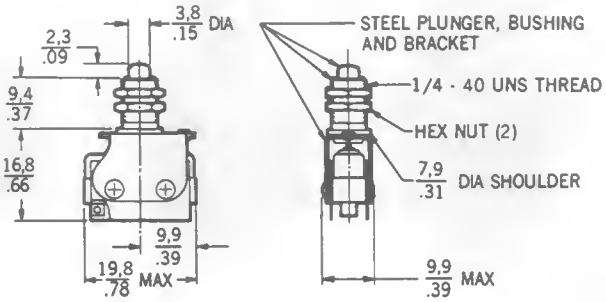
Manual Switches
Pushbutton Switches

MOUNTING DIMENSIONS (For reference only)

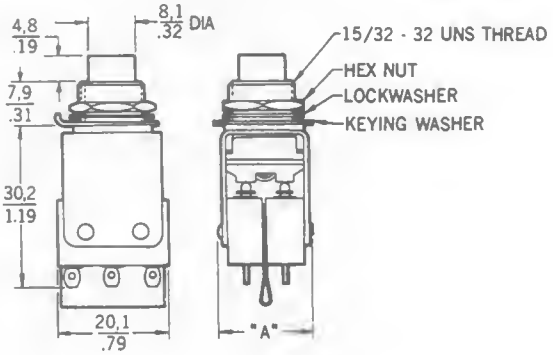
Watertight Switch

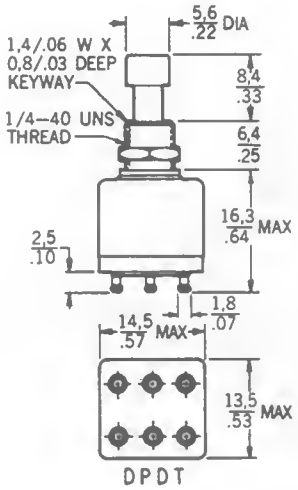


Miniature Size Switches



Hermetically Sealed Switches





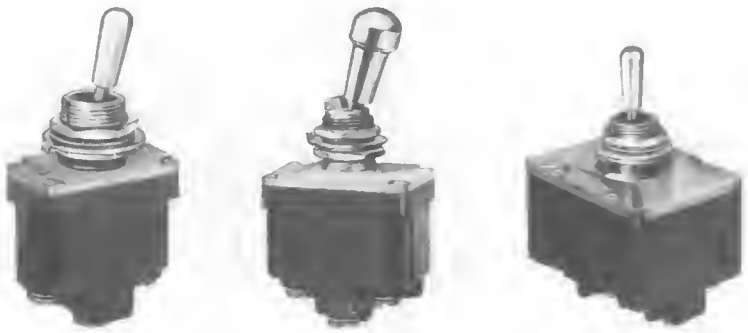
Mounting hardware includes: hexnut, lockwasher, and keying washer.

	2-Pole	4-Pole
Dim. "A" (max.)	16,8/.66	30,0/1.18

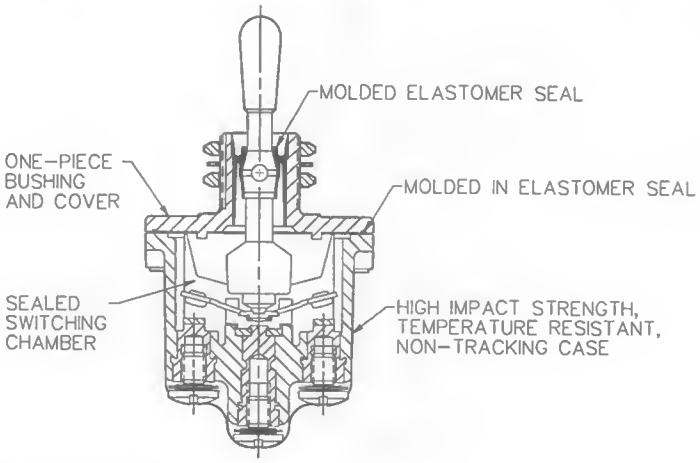
Key: 0,0 = mm / 0.00 = inches

Pushbuttons

Manual Switches
Sealed Toggle Switches



CONSTRUCTION



UL AND CSA ELECTRICAL RATINGS

Rating Code*	Electrical Rating
L192	10 amps, 125, 250, 277 VAC; ¼ Hp, 125 VAC; ½ Hp, 250, 277 VAC; 3 amps, 125 VAC "L"
L191	15 amps, 125, 250, 277 VAC; ½ Hp, 125 VAC; 1 Hp, 250, 277 VAC; 5 amps, 125 VAC "L"

* Referred to in order guides.

ELECTRICAL RATINGS

In Amperes

Elect. Rating Code	28 Volts DC			115 VDC	250 VDC	115 Volts AC 60 & 400 Hz			230 VAC
	Ind.	Res.	Lamp	Res.	Res.	Ind.	Res.	Lamp	Res.
1	12	20	5	0.75	0.5	10	15	3	6
2	10	15	4	0.75	0.5	7	15	2	6
3	15	20	7	0.75	0.5	15	15	4	6
4	10	18	5	0.75	0.5	8	11	2	6
5	12	20	5	0.75	0.5	15	15	4	6
6	10	18	4	0.75	0.5	8	11	2	6

Application Note: Honeywell MICRO SWITCH does *not* recommend the use of silver cadmium oxide switch contacts in non-arcing loads. Non-arcing loads are generally loads less than 12 volts and/or 0.5 amp. NT switches use silver cadmium oxide contacts. For other options, contact the MICRO SWITCH Application Center at 1-800-537-6945.

FEATURES

- Completely sealed switching chamber
- Step-design case provides added space between terminals to help prevent shorting
- 1, 2 or 4-pole circuitry
- Standard and pull to unlock levers.
- 2 or 3 positions, maintained and momentary action
- Spring-loaded actuating mechanism provides excellent tactile feedback
- High impact strength, non-tracking case enhances electrical stability
- Temperature range: –40 to 71°C (–40 to 160°F)
- UL recognized, File E12252, Vol. 1, Section 44
- CSA certified, File LR4442
- CE approved

GENERAL INFORMATION

MICRO SWITCH NT Series toggle switches meet severe environment application needs for a rugged, cost-effective toggle switch. Quality construction features include a molded-in elastomer seal between the toggle lever and bushing, and between the cover and case. In addition, the terminal inserts are molded into the high impact strength thermoplastic case.

Complete sealing of the switching chamber enables NT toggles to comply with UL 508, paragraph 13.3 hosedown test. These switches can be used where panels are subjected to periodic splash and washdowns, such as are common to food and beverage equipment. They will also withstand exposure to heavy accumulations of early morning dew that may condense on the control panel in cabs of vehicles left outdoors overnight.

PULL-TO-UNLOCK LEVERS

Pull-to-unlock toggle levers prevent accidental toggle movement. The knobbed toggle lever must be pulled out approximately .09 in. (2,3 mm) to change positions. Thirteen different locking configurations are available. This lever style also has a non-glare matte nickel finish.

Manual Switches
Sealed Toggle Switches

NT 2-POSITION ORDER GUIDE

No. of Poles	Circuits Made With Toggle At: Keyway Position	Opposite Keyway	UL Rating Code	Elect. Rating Code	Standard Lever Termination Style: Screw	Solder	Q-C	Pull-To-Unlock Lever (Add suffix to Standard Lever Listing)
1	OFF	2-3	L191	1	1NT1-2	11NT1-2	1NT91-2	D, F, G
	1-2	2-3	L191	1	1NT1-3	11NT1-3	1NT91-3	D, F, G
	OFF*	2-3	L192	2	1NT1-4	11NT1-4	1NT91-4	F
	1-2*	OFF	L192	2	1NT1-6	11NT1-6	1NT91-6	F
	1-2*	2-3	L192	2	1NT1-8	11NT1-8	1NT91-8	F
2	OFF	2-3, 5-6	L191	3	2NT1-2	12NT1-2	2NT91-2	D, F, G
	1-2, 4-5	2-3, 5-6	L191	3	2NT1-3	12NT1-3	2NT91-3	F
	OFF*	2-3, 5-6	L192	4	2NT1-4	12NT1-4	2NT91-4	F
	1-2, 4-5*	OFF	L192	4	2NT1-6	12NT1-6	2NT91-6	D, F, G
	1-2, 4-5*	2-3, 5-6	L192	4	2NT1-8	12NT1-8	2NT91-8	F
4	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4NT1-2	14NT1-2	4NT91-2	D, F, G
	1-2, 4-5, 7-8, 10-11	2-3, 5-6, 8-9, 11-12	L191	5	4NT1-3	14NT1-3	4NT91-3	F
	OFF*	2-3, 5-6, 8-9, 11-12	L192	6	4NT1-4	14NT1-4	4NT91-4	F
	1-2, 4-5, 7-8, 10-11*	OFF	L192	6	4NT1-6	14NT1-6	4NT91-6	D, F, G
	1-2, 4-5, 7-8, 10-11*	2-3, 5-6, 8-9, 11-12	L192	6	4NT1-8	14NT1-8	4NT91-8	F

NT 3-POSITION ORDER GUIDE

No. of Poles	Circuits Made With Toggle At: Keyway Position	Center Position	Opposite Keyway	UL Rating Code	Elect. Rating Code	Standard Lever Termination Style: Screw	Solder	Q-C	Pull-To-Unlock Lever (Add suffix to Standard Lever Listing)
1	1-2	OFF	2-3	L191	1	1NT1-1	11NT1-1	1NT91-1	ALL TYPES
	1-2*	OFF	2-3	L192	2	1NT1-5	11NT1-5	1NT91-5	E, F, K, L, M, N
	1-2*	OFF	2-3*	L192	2	1NT1-7	11NT1-7	1NT91-7	E, L, N
	NONE**	OFF	2-3	L191	1	1NT1-21	11NT1-21	1NT91-21	E, F, K, M
	NONE**	1-2	2-3	L191	1	1NT1-31	11NT1-31	1NT91-31	E, F, K, M
	NONE**	1-2	2-3*	L192	2	1NT1-51	11NT1-51	1NT91-51	E
	1-2*	OFF	NONE**	L192	2	1NT1-61	11NT1-61	1NT91-61	E
2	1-2, 4-5	OFF	2-3, 5-6	L191	3	2NT1-1	12NT1-1	2NT91-1	ALL TYPES
	1-2, 4-5*	OFF	2-3, 5-6	L192	4	2NT1-5	12NT1-5	2NT91-5	E, F, K, L, M, N
	1-2, 4-5*	OFF	2-3, 5-6*	L192	4	2NT1-7	12NT1-7	2NT91-7	E, L, N
	NONE*	OFF	2-3, 5-6	L191	3	2NT1-21	12NT1-21	2NT91-21	E, F, K, M
	NONE**	1-2, 4-5	2-3, 5-6	L191	3	2NT1-31	12NT1-31	2NT91-31	E, F, K, M
	NONE**	1-2, 4-5	2-3, 5-6*	L192	4	2NT1-51	12NT1-51	2NT91-51	E
	1-2, 4-5*	OFF	NONE**	L192	4	2NT1-61	12NT1-61	2NT91-61	E
	1-2, 4-5	2-3, 4-5	2-3, 5-6	L191	3	2NT1-12	12NT1-12	2NT91-12	ALL TYPES
	1-2, 4-5	1-2, 5-6	2-3, 5-6	L191	3	2NT1-10	12NT1-10	2NT91-10	ALL TYPES
	1-2, 4-5*	1-2, 5-6	2-3, 5-6	L192	4	2NT1-50	12NT1-50	2NT91-50	L, F, K, L, M, N
	1-2, 4-5*	1-2, 5-6	2-3, 5-6*	L192	4	2NT1-70	12NT1-70	2NT91-70	E, L, N
4	1-2, 4-5, 7-8, 10-11	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4NT1-1	14NT1-1	4NT91-1	ALL TYPES
	1-2, 4-5, 7-8, 10-11*	OFF	2-3, 5-6, 8-9, 11-12	L192	6	4NT1-5	14NT1-5	4NT91-5	E, F, K, L, M, N
	1-2, 4-5, 7-8, 10-11*	OFF	2-3, 5-6, 8-9, 11-12*	L192	6	4NT1-7	14NT1-7	4NT91-7	E, L, N
	NONE*	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4NT1-21	14NT1-21	4NT91-21	E, F, K, M
	NONE**	1-2, 4-5, 7-8, 10-11	2-3, 5-6, 8-9, 11-12	L191	5	4NT1-31	14NT1-31	4NT91-31	E, F, K, M
	NONE**	1-2, 4-5, 7-8, 10-11	2-3, 5-6, 8-9, 11-12*	L192	6	4NT1-51	14NT1-51	4NT91-51	E
	1-2, 4-5, 7-8, 10-11*	OFF	NONE**	L192	6	4NT1-61	14NT1-61	4NT91-61	E
	1-2, 4-5, 7-8, 10-11	2-3, 4-5, 7-8, 11-12	2-3, 5-6, 8-9, 11-12	L191	5	4NT1-12	14NT1-12	4NT91-12	ALL TYPES
	1-2, 4-5 7-8, 10-11	2-3, 4-5	2-3, 5-6 8-9, 11-12	L191	5	4NT1-10	14NT1-10	4NT91-10	ALL TYPES
	1-2, 4-5, 7-8, 10-11*	2-3, 4-5, 7-8, 11-12	2-3, 5-6, 8-9, 11-12	L192	6	4NT1-50	14NT1-50	4NT91-50	E, F, K, L, M, N
	1-2, 4-5, 7-8, 10-11*	2-3, 4-5	2-3, 5-6, 8-9, 11-12*	L192	6	4NT1-70	14NT1-70	4NT91-70	E, L, N

* These positions are momentary. All others are maintained.
** Toggle lever is blocked from these products. Toggle becomes 2-position, with center being one extreme position.

Manual Switches
Sealed Toggle Switches

PULL-TO-UNLOCK OPTION

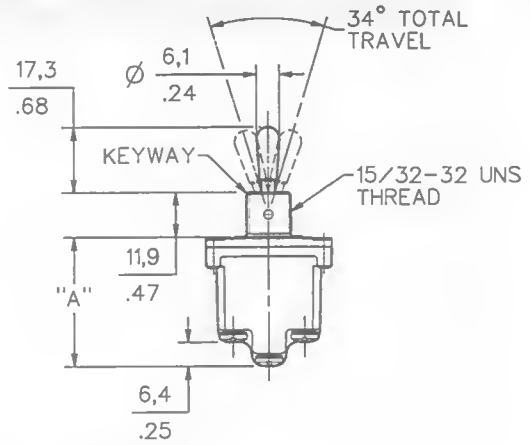
When ordering pull-to-unlock toggle listings, add the suffix letter shown in the chart below to the standard toggle listing and the MS number. For example, to order a INTI-1 pull-to-unlock toggle switch with the lever locked in the center position, add the letter **E**; i.e., INTI-1**E**.

LOCKING CONFIGURATIONS

A	B	D	E	F	G	H
Locked In Three Positions	Locked In Center and Extreme Position (Keyway Side)	Locked Out Of Center Position	Locked In Center Position	Locked In Extreme Position (Opposite Keyway)	Locked In Extreme Position (Keyway Side)	Locked Out Of Center And Extreme Position (Keyway Side)

J	K	L	M	N	P
Locked Out Of Center And Extreme Position (Opposite Keyway)	Locked In Center And Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Keyway Side)	Locked Out Of And Into Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Opposite Keyway)	Locked Out Of And Into Extreme Position (Keyway Side)

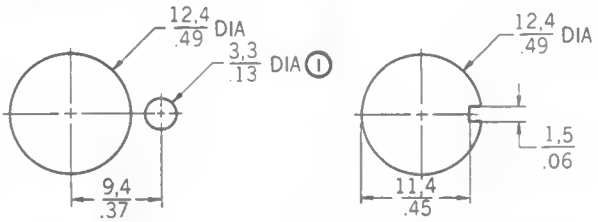
MOUNTING DIMENSIONS:
(For reference only)



	DIM "A"
1-pole	29,5/1.16
2 & 4-pole	34,4/1.35

Key: 0,0 = mm / 0.00 = inches

Panel cutout

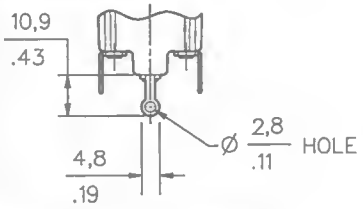


With locking ring — Without locking ring

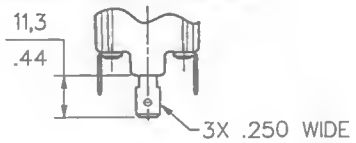
Note:
① 1,4/.06 MIN DEEP TO ACCOMMODATE LOCKING RING. 15PA87 PANEL SEAL REQUIRES BLIND HOLE TO INSURE SEAL INTEGRITY

NOTES:
1. Pull-to-unlock levers have 10,7/42 dia. knob
2. Locking ring, lockwasher, 2 hexnuts and terminal screws are furnished unassembled.

Solder Terminals

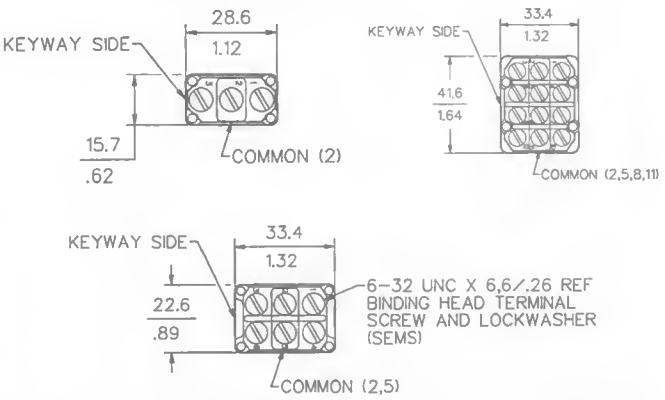


Quick Connect Terminals



Bushing mounting torque is 10–15 in./lbs.
Terminal screw mounting torque is 5 in./lbs. max.

Terminal Circuit Identification



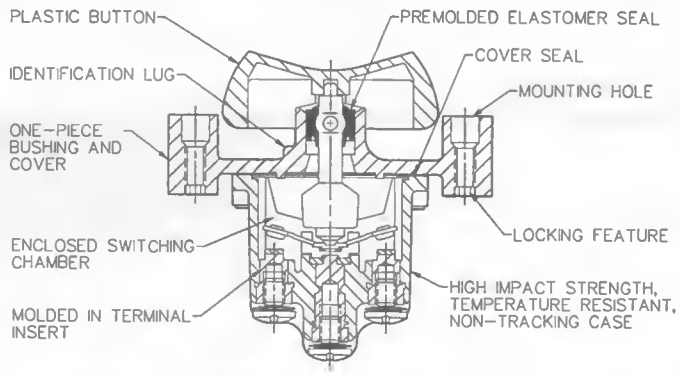
Manual Switches
Sealed Rocker Switches

NR Series

GENERAL INFORMATION
MICRO SWITCH NR Series Rocker Switches meet severe environment application needs for a rugged, cost-effective manual switch. They combine the advantages of toggle switch circuit versatility with pushbutton control.

Quality construction features include a premolded elastomer seal between the actuator and bushing and an elastomer cover/case gasket seal. Also, the terminal inserts are molded into the high impact strength thermoplastic case.

Complete sealing of the switching chamber enables compliance with UL 508, paragraph 13.3 hosedown test. These switches can be used where panels are subjected to periodic splash and washdowns, such as are common to food and beverage equipment. They will also withstand exposure to heavy accumulations of eary morning dew that may condense on the control panel in cabs of vehicles left outdoors overnight.



Above Panel Mount **Flush Panel Mount**

FEATURES
- Completely sealed switching chamber
- Colored removable rockers
- Choice of flush-panel or above-panel mounting
- Step-design case provides added space between terminals to help prevent shorting
- 1, 2 or 4-pole circuitry
- 2 or 3 positions, maintained and momentary action
- Spring-loaded actuating mechanism provides excellent tactile feedback
- High impact strength, non-tracking case enhances electrical stability
- Temperature range: −40 to 71°C (−40 to 160°F)
- UL recognized, File E12252, Vol. 1, Section 44
- CSA certified, File LR4442
- CE approved

HOW TO ORDER
1. **To order flush panel mount switches *without rockers,*** specify the listings in the NR order guides.

2. **To specify above-panel mount switches,** change the **1** (after "NR") in 1NR**1**, 11NR**1**, 2NR**1**, 12NR**1**, 4NR**1**, and 14NR**1** listings in the NR order guides to **4**. Example: 1NR1-2W converts to 1NR4-2, 11NR1-2 to 11NR4-2.

   For 1NR91, 2NR91, and 14NR91 listings add **4** (after the "NR") to specify the above panel mount version. Example: 1NR91-2 becomes 1NR491-2.

3. **To order rockers,** specify listings in the 12PA rocker order guide.

ELECTRICAL RATINGS
L191: 15 amps, 125, 250, 277 VAC; ½ Hp, 125 VAC; 1 Hp, 250, 277 VAC; 5 amps, 125 VAC "L"
L192: 10 amps, 125, 250, 277 VAC; ¼ Hp, 125 VAC; ½ Hp, 250, 277 VAC; 3 amps, 125 VAC "L"

12PA ROCKER ORDER GUIDE
Note: These listings are used to specify rockers only.

Rocker Color	Catalog Listing
White	12PA12-W
Red	12PA12-R
Yellow	12PA12-Y
Black	12PA12-BK
Green	12PA12-G
Blue	12PA12-BL

ELECTRICAL RATINGS
In Amperes (See Application Note on next page)

Elect. Rating Code	28 Volts DC			115 VDC	250 VDC	115 Volts AC 60 & 400 Hz			230 VAC
	Ind.	Res.	Lamp	Res.	Res.	Ind.	Res.	Lamp	Res.
1	12	20	5	0.75	0.5	10	15	3	6
2	10	15	4	0.75	0.5	7	15	2	6
3	15	20	7	0.75	0.5	15	15	4	6
4	10	18	5	0.75	0.5	8	11	2	6
5	12	20	5	0.75	0.5	15	15	4	6
6	10	18	4	0.75	0.5	8	11	2	6

Manual Switches

Sealed Rocker Switches

NOTE: Catalog listings in the order guides below do not include rocker operators. See "How to Order."

Application Note: Honeywell MICRO SWITCH does *not* recommend the use of silver cadmium oxide switch contacts in non-arcing loads. Non-arcing loads are generally loads less than 12 volts and/or 0.5 amp. NR switches use silver cadmium oxide contacts. For other options, contact the MICRO SWITCH Application Center at 1-800-537-6945.

NR 2-POSITION FLUSH-PANEL MOUNT ROCKERS ORDER GUIDE

No. of Poles	Circuits Made With Rocker At: Ident. Lug Position	Opposite Lug Position	UL Rating Code	Elect. Rating Code	Termination Style: Screw	Solder	Q-C
1	OFF	2-3	L191	1	1NR1-2	11NR1-2	1NR91-2
	1-2	2-3	L191	1	1NR1-3	11NR1-3	1NR91-3
	OFF*	2-3	L192	2	1NR1-4	11NR1-4	1NR91-4
	1-2*	OFF	L192	2	1NR1-6	11NR1-6	1NR91-6
	1-2*	2-3	L192	2	1NR1-8	11NR1-8	1NR91-8
2	OFF	2-3, 5-6	L191	3	2NR1-2	12NR1-2	2NR91-2
	1-2, 4-5	2-3, 5-6	L191	3	2NR1-3	12NR1-3	2NR91-3
	OFF*	2-3, 4-6	L192	4	2NR1-4	12NR1-4	2NR91-4
	1-2, 4-5*	OFF	L192	4	2NR1-6	12NR1-6	2NR91-6
	1-2, 4-5*	2-3, 4-6	L192	4	2NR1-8	12NR1-8	2NR91-8
4	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4NR1-2	14NR1-2	4NR91-2
	1-2, 4-5, 7-8, 10-11	2-3, 5-6, 8-9, 11-12	L191	5	4NR1-3	14NR1-3	4NR91-3
	OFF*	2-3, 5-6, 8-9, 11-12	L192	6	4NR1-4	14NR1-4	4NR91-4
	1-2, 4-5, 7-8, 10-11*	OFF	L192	6	4NR1-6	14NR1-6	4NR91-6
	1-2, 4-5, 7-8, 10-11*	2-3, 5-6, 8-9, 11-12	L192	6	4NR1-8	14NR1-8	4NR91-8

NR 3-POSITION FLUSH-PANEL MOUNT ROCKERS ORDER GUIDE

No. of Poles	Circuits Made With Toggle At: Ident. Lug Position	Center Position	Opposite Lug Position	UL Rating Code	Elect. Rating Code	Termination Style: Screw	Solder	Q-C
1	1-2	OFF	2-3	L191	1	1NR1-1	11NR1-1	1NR91-1
	1-2*	OFF	2-3	L192	2	1NR1-5	11NR1-5	1NR91-5
	1-2*	OFF	2-3*	L192	2	1NR1-7	11NR1-7	1NR91-7
	NONE**	OFF	2-3	L191	1	1NR1-21	11NR1-21	1NR91-21
	NONE**	1-2	2-3	L191	1	1NR1-31	11NR1-31	1NR91-31
	NONE**	1-2	2-3*	L192	2	1NR1-51	11NR1-51	1NR91-51
	1-2*	OFF	NONE**	L192	2	1NR1-61	11NR1-61	1NR91-61
2	1-2, 4-5	OFF	2-3, 5-6	L191	3	2NR1-1	12NR1-1	2NR91-1
	1-2, 4-5*	OFF	2-3, 5-6	L192	4	2NR1-5	12NR1-5	2NR91-5
	1-2, 4-5*	OFF	2-3, 5-6*	L192	4	2NR1-7	12NR1-7	2NR91-7
	NONE*	OFF	2-3, 5-6	L191	3	2NR1-21	12NR1-21	2NR91-21
	NONE**	1-2, 4-5	2-3, 5-6	L191	3	2NR1-31	12NR1-31	2NR91-31
	NONE**	1-2, 4-5	2-3, 5-6*	L192	4	2NR1-51	12NR1-51	2NR91-51
	1-2, 4-5*	OFF	NONE**	L192	4	2NR1-61	12NR1-61	2NR91-61
	1-2, 4-5	2-3, 4-5	2-3, 5-6	L191	3	2NR1-12	12NR1-12	2NR91-12
	1-2, 4-5*	1-2, 5-6	2-3, 5-6	L192	4	2NR1-50	12NR1-50	2NR91-50
	1-2, 4-5*	1-2, 5-6	2-3, 5-6*	L192	4	2NR1-70	12NR1-70	2NR91-70
4	1-2, 4-5, 7-8, 10-11	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4NR1-1	14NR1-1	4NR91-1
	1-2, 4-5, 7-8, 10-11*	OFF	2-3, 5-6, 8-9, 11-12	L192	6	4NR1-5	14NR1-5	4NR91-5
	1-2, 4-5, 7-8, 10-11*	OFF	2-3, 5-6, 8-9, 11-12*	L192	6	4NR1-7	14NR1-7	4NR91-7
	NONE*	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4NR1-21	14NR1-21	4NR91-21
	NONE**	1-2, 4-5, 7-8, 10-11	2-3, 5-6, 8-9, 11-12	L191	5	4NR1-31	14NR1-31	4NR91-31
	NONE**	1-2, 4-5, 7-8, 10-11	2-3, 5-6, 8-9, 11-12*	L192	6	4NR1-51	14NR1-51	4NR91-51
	1-2, 4-5, 7-8, 10-11*	OFF	NONE**	L192	6	4NR1-61	14NR1-61	4NR91-61
	1-2, 4-5, 7-8, 10-11	2-3, 4-5, 7-8, 11-12	2-3, 5-6, 8-9, 11-12	L191	5	4NR1-12	14NR1-12	4NR91-12
	1-2, 4-5, 7-8, 10-11*	2-3, 4-5, 7-8, 11-12	2-3, 5-6, 8-9, 11-12	L192	6	4NR1-50	14NR1-50	4NR91-50
	1-2, 4-5, 7-8, 10-11*	2-3, 4-5	2-3, 5-6, 8-9, 11-12*	L192	6	4NR1-70	14NR1-70	4NR91-70

* These positions are momentary. All others are maintained.
** Toggle lever is blocked from these products. Toggle becomes 2-position, with center being one extreme position.

TERMINAL CIRCUIT IDENTIFICATION

Terminal identification numbers referenced in the order guides are molded into the switch base.

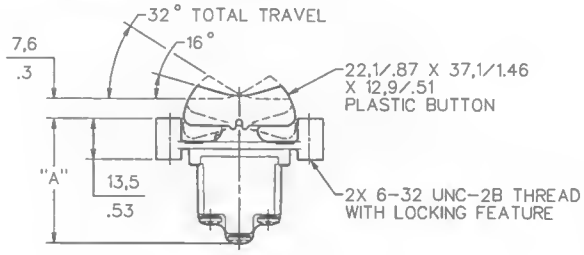
These numbers indicate which circuits are made in each rocker position (e.g. "**1-2**" refers to circuit closure through terminals **1** and **2**).

Manual Switches
Seated Rocker Switches

MOUNTING DIMENSIONS
(For reference only)

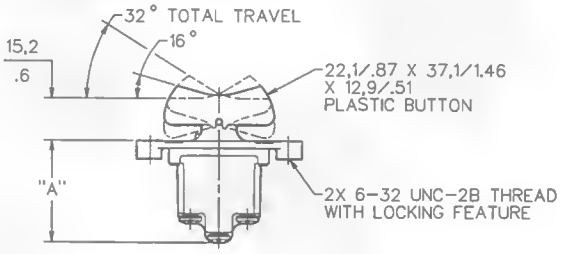
Key: 0,0 = mm / 0.00 = inches

Flush Panel



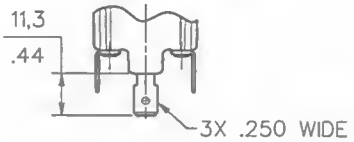
	DIM "A"
1-POLE	36,8/1.45
2 & 4-POLE	41,7/1.64

Above Panel

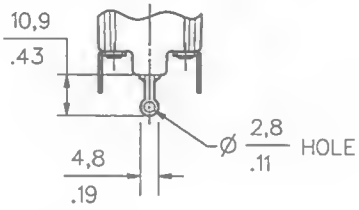


	DIM "A"
1-POLE	29,5/1.16
2 & 4-POLE	34,4/1.35

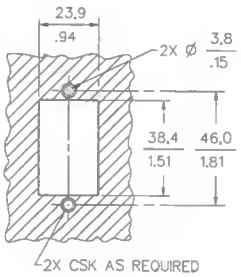
Quick Connect Terminals



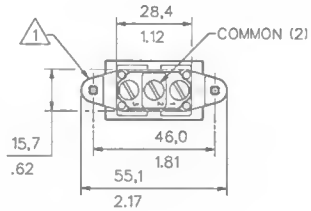
Solder Terminals



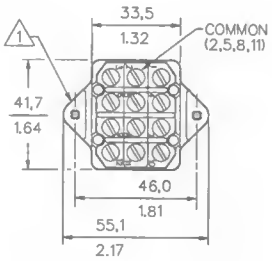
Panel Cutout



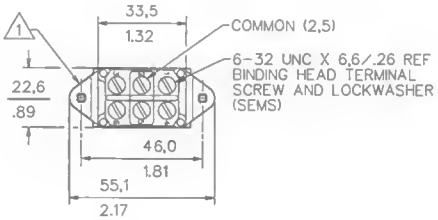
Terminal Circuit Identification



1 IDENTIFICATION LUG SIDE



1 IDENTIFICATION LUG SIDE

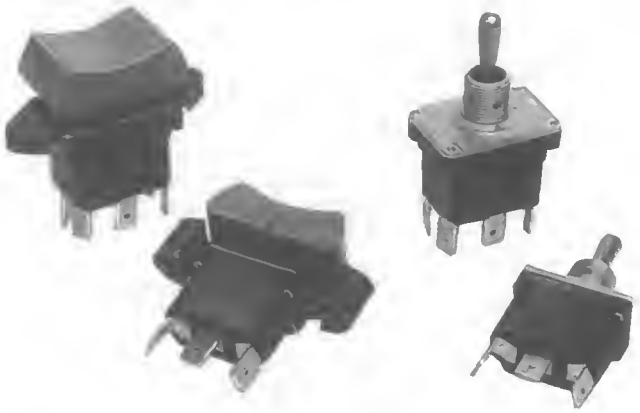


1 IDENTIFICATION LUG SIDE

Flange mounting torque is 10–12 in./lbs.
Terminal screw mounting torque is 5 in./lbs. max.

Manual Switches

Flat Base Sealed Toggles and Rockers



FEATURES

- Sealed switching chamber
- 1 or 2-pole circuitry
- 2 or 3 position maintained and momentary action
- Flat base with quick-connect terminals – mating connectors are available
- Brightly colored removable rockers
- Spring-loaded actuating mechanism provides tactile feedback
- High impact strength, non-tracking case enhances electrical stability
- Temperature range: –40 to 71°C (–40 to 160°F)
- UL Recognized, File E12252, vol. 1, section 44
- CSA Certified, File LR4442
- CE approved

UL AND CSA ELECTRICAL RATINGS

Rating Code*	Electrical Rating
L192	10 amps, 125, 250, 277 VAC; ¼ Hp, 125 VAC; ½ Hp, 250, 277 VAC; 3 amps, 125 VAC "L"
L191	15 amps, 125, 250, 277 VAC; ½ Hp, 125 VAC; 1 Hp, 250, 277 VAC; 5 amps, 125 VAC "L"

ELECTRICAL RATINGS

In Amperes

Rating Code	28 Volts DC			115 VDC	250 VDC	115 Volts AC 60 & 400 Hz			230 VAC
	Ind.	Res.	Lamp	Res.	Res.	Ind.	Res.	Lamp	Res.
1	12	20	5	0.75	0.5	10	15	3	6
2	10	15	4	0.75	0.5	7	15	2	6
3	15	20	7	0.75	0.5	15	15	4	6
4	10	18	5	0.75	0.5	8	11	2	6

Application Note: Honeywell MICRO SWITCH does *not* recommend the use of silver cadmium oxide switch contacts in non-arcing loads. Non-arcing loads are generally loads less than 12 volts and/or 0.5 amp. NT/NR switches use silver cadmium oxide contacts. For other options, contact the MICRO SWITCH Application Center at 1-800-537-6945.

GENERAL INFORMATION

MICRO SWITCH NT Series toggle switches and NR Series rocker switches are designed to meet severe environment application needs for rugged, cost-effective manual switches. These flat base style products are identical to the stepped base style in construction and features. The flat base allows for PC board or connector use for easy wiring/connection. The flat base NT toggle switches and NR rocker switches are provided with quick-connect (spade) termination. Mating connectors are available.

TERMINAL CIRCUIT IDENTIFICATION

Terminal identifications are referenced in the order guides to indicate which circuits are made in each toggle position (e.g. "**1-2**" refers to circuit closure through terminals **1** and **2**).

Manual Switches

Flat Base Sealed Toggles

NT 2-POSITION ORDER GUIDE

No. of Poles	Circuits Made At: Keyway Position	Circuits Made At: Opposite Keyway	UL Rating Code	Electrical Rating Code	Catalog Listing Toggle Q-C
1	OFF	2-3	L191	1	31NT91-2
	1-2	2-3	L191	1	31NT91-3
	OFF**	2-3	L192	2	31NT91-4
	1-2**	OFF	L192	2	31NT91-6
	1-2**	2-3	L192	2	31NT91-8
2	OFF	2-3, 5-6	L191	3	32NT91-2
	1-2, 4-5	2-3, 5-6	L191	3	32NT91-3
	OFF**	2-3, 4-6	L192	4	32NT91-4
	1-2, 4-5**	OFF	L192	4	32NT91-6
	1-2, 4-5**	2-3, 4-6	L192	4	32NT91-8

NT 3-POSITION ORDER GUIDE

No. of Poles	Circuits Made At: Keyway Position	Circuits Made At: Center Position	Circuits Made At: Opposite Keyway	UL Rating Code	Electrical Rating Code	Catalog Listing Toggle Q-C
1	1-2	OFF	2-3	L191	1	31NT91-1
	1-2**	OFF	2-3	L192	2	31NT91-5
	1-2**	OFF	2-3**	L192	2	31NT91-7
	NONE***	OFF	2-3	L191	1	31NT91-21
	NONE***	1-2	2-3	L191	1	31NT91-31
	NONE***	1-2	2-3**	L192	2	31NT91-51
	1-2**	OFF	NONE***	L192	2	31NT91-61
2	1-2, 4-5	OFF	2-3, 5-6	L191	3	32NT91-1
	1-2, 4-5**	OFF	2-3, 5-6	L192	4	32NT91-5
	1-2, 4-5**	OFF	2-3, 5-6**	L192	4	32NT91-7
	NONE***	OFF	2-3, 5-6	L191	3	32NT91-21
	NONE***	1-2, 4-5	2-3, 5-6	L191	3	32NT91-31
	NONE***	1-2, 4-5	2-3, 5-6**	L192	4	32NT91-51
	1-2, 4-5**	OFF	NONE***	L192	4	32NT91-61
	1-2, 4-5	2-3, 4-5	2-3, 5-6	L191	3	32NT91-12
	1-2, 4-5	1-2, 5-6	2-3, 5-6	L191	3	32NT91-10
	1-2, 4-5**	1-2, 5-6	2-3, 5-6	L192	4	32NT91-50
	1-2, 4-5**	1-2, 5-6	2-3, 5-6**	L192	4	32NT91-70

** These positions are momentary. All others are maintained.
*** Toggle lever is blocked from these positions. Toggle becomes 2-position, with center being one extreme position.

MATING CONNECTORS ORDER GUIDE

Description	Catalog Listing
2-pole connector	19PA168-NT
1-pole connector, same package size as 2-pole connector	19PA169-NT

LOCKING CONFIGURATIONS

A	B	D	E	F	G	H
Locked In Three Positions	Locked In Center and Extreme Position (Keyway Side)	Locked Out Of Center Position	Locked In Center Position	Locked In Extreme Position (Opposite Keyway)	Locked In Extreme Position (Keyway Side)	Locked Out Of Center And Extreme Position (Keyway Side)

J	K	L	M	N	P
Locked Out Of Center And Extreme Position (Opposite Keyway)	Locked In Center And Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Keyway Side)	Locked Out Of And Into Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Opposite Keyway)	Locked Out Of And Into Extreme Position (Keyway Side)

Toggle/Rockers

Manual Switches

Flat Base Sealed Rockers

NR 2-POSITION ORDER GUIDE

No. of Poles	Circuits Made At: Keyway Position	Circuits Made At: Opposite Keyway	UL Rating Code	Electrical Rating Code	Catalog Listing Rocker* Q-C
1	OFF	2-3	L191	1	31NT91-2
	1-2	2-3	L191	1	31NR91-3
	OFF**	2-3	L192	2	31NR91-4
	1-2**	OFF	L192	2	31NR91-6
	1-2**	2-3	L192	2	31NR91-8
2	OFF	2-3, 5-6	L191	3	32NR91-2
	1-2, 4-5	2-3, 5-6	L191	3	32NR91-3
	OFF**	2-3, 4-6	L192	4	32NR91-4
	1-2, 4-5**	OFF	L192	4	32NR91-6
	1-2, 4-5**	2-3, 4-6	L192	4	32NR91-8

NT 3-POSITION ORDER GUIDE

No. of Poles	Circuits Made At: Keyway Position	Circuits Made At: Center Position	Circuits Made At: Opposite Keyway	UL Rating Code	Electrical Rating Code	Catalog Listing Rocker* Q-C
1	1-2	OFF	2-3	L191	1	31NR91-1
	1-2**	OFF	2-3	L192	2	31NR91-5
	1-2**	OFF	2-3**	L192	2	31NR91-7
	NONE***	OFF	2-3	L191	1	31NR91-21
	NONE***	1-2	2-3	L191	1	31NR91-31
	NONE***	1-2	2-3**	L192	2	31NR91-51
	1-2**	OFF	NONE***	L192	2	31NR91-61
2	1-2, 4-5	OFF	2-3, 5-6	L191	3	32NR91-1
	1-2, 4-5**	OFF	2-3, 5-6	L192	4	32NR91-5
	1-2, 4-5**	OFF	2-3, 5-6**	L192	4	32NR91-7
	NONE***	OFF	2-3, 5-6	L191	3	32NR91-21
	NONE***	1-2, 4-5	2-3, 5-6	L191	3	32NR91-31
	NONE***	1-2, 4-5	2-3, 5-6**	L192	4	32NR91-51
	1-2, 4-5**	OFF	NONE***	L192	4	32NR91-61
	1-2, 4-5	2-3, 4-5	2-3, 5-6	L191	3	32NR91-12
	1-2, 4-5	1-2, 5-6	2-3, 5-6	L191	3	32NR91-10
	1-2, 4-5**	1-2, 5-6	2-3, 5-6	L192	4	32NR91-50
	1-2, 4-5**	1-2, 5-6	2-3, 5-6**	L192	4	32NR91-70

* Does not include rocker button. Order separately from chart.
** These positions are momentary. All others are maintained.
*** Toggle lever is blocked from these positions. Toggle becomes 2-position, with center being one extreme position.

MATING CONNECTORS ORDER GUIDE

Description	Catalog Listing
2-pole connector	19PA168-NT
1-pole connector, same package size as 2-pole connector	19PA169-NT

ELECTRICAL RATING

L191: 15 amps, 125, 250, 277 VAC; ½ Hp, 125 VAC; 1 Hp, 250, 277 VAC; 5 amps, 125 VAC "L"

L192: 10 amps, 125, 250, 277 VAC; ¼ Hp, 125 VAC; ½ Hp, 250, 277 VAC; 3 amps, 125 VAC "L"

TERMINAL CIRCUIT IDENTIFICATION

Terminal identifications are referenced in the order guides to indicate which circuits are made in each toggle position (e.g., "**1-2**" refers to circuit closure through terminals **1** and **2**).

Top specify above-panel mount rockers: add **4** (after the "NR") to specify the above panel version. Example: 31NR91-5 becomes 31NR491-5.

ROCKER BUTTONS ORDER GUIDE

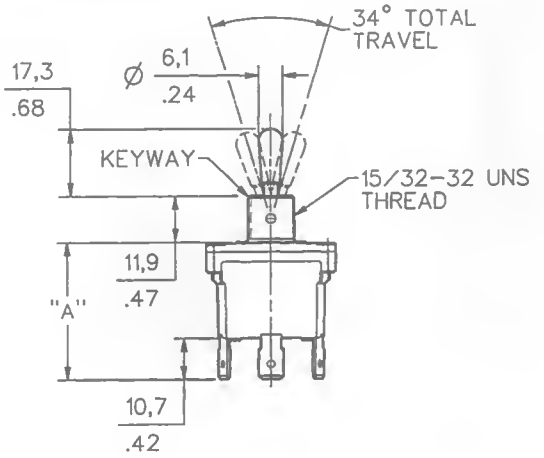
Rocker Color	Catalog Listing
White	12PA12-W
Red	12PA12-R
Yellow	12PA12-Y
Black	12PA12-BK
Green	12PA12-G
Blue	12PA12-BL

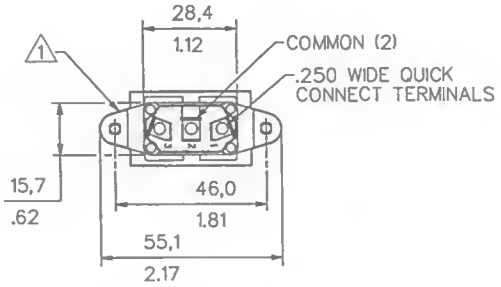
Manual Switches

Flat Base Sealed Toggles and Rockers

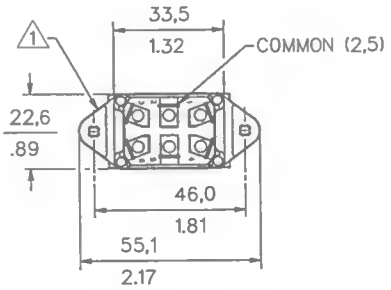
MOUNTING DIMENSIONS (For reference only)

Toggle Switches





1 IDENTIFICATION LUG SIDE

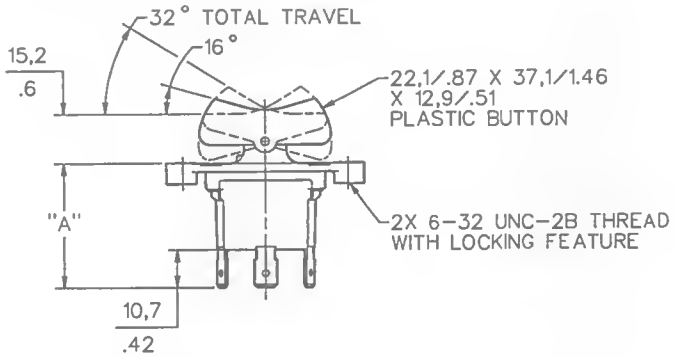


1 IDENTIFICATION LUG SIDE

Bushing mounting torque is 10–15 in./lbs.

Rocker Switches, Above Panel

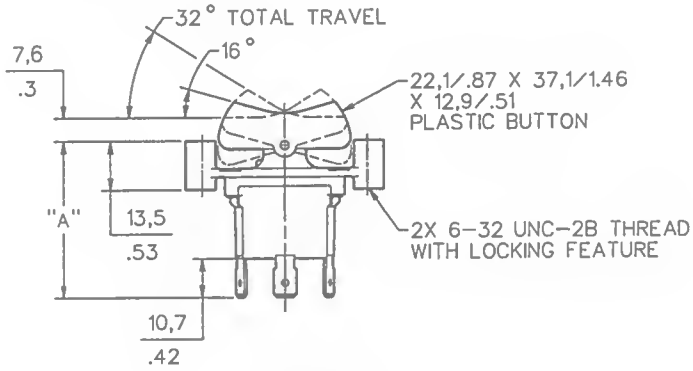
ABOVE PANEL



	DIM "A"
1-POLE	31,1/1.23
2-POLE	36,0/1.42

Rocker Switches, Flush Panel

FLUSH PANEL



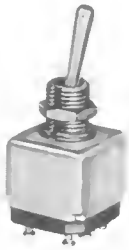
	DIM "A"
1-POLE	38,4/1.52
2-POLE	43,3/1.71

Flange mounting torque is 10–12 in./lbs.

Manual Switches
Miniature Toggle Switches

11TW Standard toggle lever
15/32" bushing

1TW Standard unsealed toggle lever
1/4" bushing



12TW Pull-to-unlock toggle lever
15/32" bushing

2TW101 Standard sealed toggle lever
1/4" bushing

- Qualified to MIL-S-83781
- Save space and weight
- SPDT and DPDT circuitry
- Choice of 1/4" or 15/32" bushings
- 15/32" bushing has lever seal
- Pull-to-unlock option on 15/32" bushing
- UL Recognized
- Temperature range: −85°F to +160°F (−65°C to +71°C)
- Sealed bushing versions

Molded-in terminals are plated for soldering. There is positive return on momentary versions. All switches come with a lockwasher, a keying washer, and two hexnuts. Special "on-on-on" circuitries, similar to those shown for TL, are also available for TW.

ELECTRICAL RATING

Volts	Amperes		
	Resistive	Inductive	Lamp
30 VDC	5	2	1
115 VAC	5	2	1
UL Code 117	5 amps @ 125 VAC		

CIRCUITRY

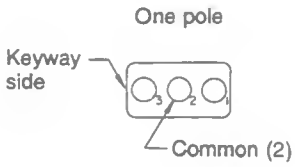
1[1] Single Pole Double Throw

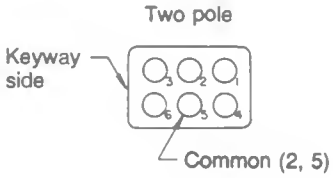
2[1] Two Single Pole Double Throw Circuits

[1]Refer to order guides.

TERMINAL CIRCUIT IDENTIFICATIONS

Terminal identifications are referred to in the Ordering Charts to indicate which circuits are made in each toggle position (i.e., "1-2" reference indicates circuit closure through terminals 1 and 2).





Manual Switches

Miniature Toggle Switches

2-POSITION ORDER GUIDES

Switches with 15/32" Bushings

No. Poles	Circuits Made with Toggle at: Keyway Position	Circuits Made with Toggle at: Opposite Keyway	Sealed Standard Toggle: Catalog Listing	Sealed Standard Toggle: Military No.	Sealed Pull-to-Unlock Toggle**: Add Suffix (next page) to Listing	Sealed Pull-to-Unlock Toggle**: Military No.**
1	OFF	2-3 ON	11TW1-2	MS27718-22-1	D, F, G	MS27720-22-1
1	2-1 ON	2-3 ON	11TW1-3	MS27718-23-1	D, F, G	MS27720-23-1
1	2-1 ON*	2-3 ON	11TW1-8	MS27718-26-1	F	MS27720-26-1
2	OFF	2-3 & 5-6 ON	12TW1-2	MS27719-22-1	D, F, G	MS27721-22-1
2	2-1 & 5-4 ON	2-3 & 5-6 ON	12TW1-3	MS27719-23-1	D, F, G	MS27721-23-1
2	2-1 & 5-4 ON*	2-3 & 5-6 ON	12TW1-8	MS27719-26-1	F	MS27721-26-1

* These positions are momentary. All others are maintained.
** Also add appropriate suffix letter to the Military Number.

Switches with 1/4" Bushings

No. Poles	Circuits Made with Toggle at: Keyway Position	Circuits Made with Toggle at: Opposite Keyway	Unsealed Standard Toggle: Catalog Listing	Unsealed Standard Toggle: Military No.	Sealed Standard Toggle: Catalog Listing
1	OFF	2-3 ON	1TW1-2	MS27716-22-1	1TW101-2
1	2-1 ON	2-3 ON	1TW1-3	MS27716-23-1	1TW101-3
1	2-1 ON*	2-3 ON	1TW1-8	MS27716-26-1	1TW101-8
2	OFF	2-3 & 5-6 ON	2TW1-2	MS27717-22-1	2TW101-2
2	2-1 & 5-4 ON	2-3 & 5-6 ON	2TW1-3	MS27717-23-1	2TW101-3
2	2-1 & 5-4 ON*	2-3 & 5-6 ON	2TW1-8	MS27717-26-1	2TW101-8

* These positions are momentary. All others are maintained.

3-POSITION ORDER GUIDES

Switches with 15/32" Bushings

No. Poles	Circuits Made with Toggle at: Keyway Position	Circuits Made with Toggle at: Center Position	Circuits Made with Toggle at: Opposite Keyway	Sealed Standard Toggle: Catalog Listing	Sealed Standard Toggle: Military No.	Sealed Pull-to-Unlock Toggle: Add Suffix (next page) to Listing	Sealed Pull-to-Unlock Toggle: Military No.**
1	2-1 ON	OFF	2-3 ON	11TW1-1	MS27718-21-1	ALL	MS27720-21-1
1	2-1 ON*	OFF	2-3 ON	11TW1-5	MS27718-31-1	E, F, K, L, M, N	MS27720-31-1
1	2-1 ON*	OFF	2-3 ON*	11TW1-7	MS27718-27-1	E, L, N	MS27720-27-1
2	2-1 & 5-4 ON	OFF	2-3 & 5-6 ON	12TW1-1	MS27719-21-1	ALL	MS27721-21-1
2	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON	12TW1-5	MS27719-31-1	E, F, K, L, M, N	MS27721-31-1
2	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON*	12TW1-7	MS27719-27-1	E, L, N	MS27721-27-1

* These positions only are momentary. All others are maintained.
** Also add appropriate suffix letter to the Military Number.

Switches with 1/4" Bushings

No. Poles	Circuits Made with Toggle at: Keyway Position	Circuits Made with Toggle at: Center Position	Circuits Made with Toggle at: Opposite Keyway	Unsealed Standard Toggle: Catalog	Unsealed Standard Toggle: Military No.	Sealed Standard Toggle: Catalog Listing
1	2-1 ON	OFF	2-3 ON	1TW1-1	MS27716-21-1	1TW101-1
1	2-1 ON*	OFF	2-3 ON	1TW1-5	MS27716-31-1	1TW101-5
1	2-1 ON*	OFF	2-3 ON*	1TW1-7	MS27716-27-1	1TW101-7
2	2-1 & 5-4 ON	OFF	2-3 & 5-6 ON	2TW1-1	MS27717-21-1	2TW101-1
2	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON	2TW1-5	MS27717-31-1	2TW101-5
2	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON*	2TW1-7	MS27717-27-1	2TW101-7

* These positions are momentary. All others are maintained.

Manual Switches
Miniature Toggle Switches

LOCKING CONFIGURATION SUFFIX

When ordering pull-to-unlock toggle listings, add the suffix letter shown in this chart to the standard toggle catalog listing and the Military Approval number.

A	B	D	E	F	G	H
Locked In Three Positions	Locked In Center and Extreme Position (Keyway Side)	Locked Out Of Center Position	Locked In Center Position	Locked In Extreme Position (Opposite Keyway)	Locked In Extreme Position (Keyway Side)	Locked Out Of Center And Extreme Position (Keyway Side)

J	K	L	M	N	P
Locked Out Of Center And Extreme Position (Opposite Keyway)	Locked In Center And Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Keyway Side)	Locked Out Of And Into Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Opposite Keyway)	Locked Out Of And Into Extreme Position (Keyway Side)

WITH IWTS TERMINATION

- 15/32" bushing has lever seal
- One or two pole circuitry
- Accepts #20 wire using M39029/1-101 contact pins
- Connections resist shock, vibration, and high pulling force

2 - POSITION ORDER GUIDE — IWTS TERMINATION

No. Poles	Circuits Made with Toggle at: Keyway Position	Circuits Made with Toggle at: Opposite Keyway	Standard Toggle Catalog Listing	Pull-to-Unlock Toggle Add Suffix to Standard Listing
1	2-1 ON	2-3 On	111TW1-3	D, F, G
1	2-1 ON*	2-3 ON	111TW1-8	F
2	2-1 & 5-4 ON	2-3 & 5-6 ON	112TW1-3	D, F, G
2	2-1 & 5-4 ON*	2-3 & 5-6 ON	112TW1-8	F

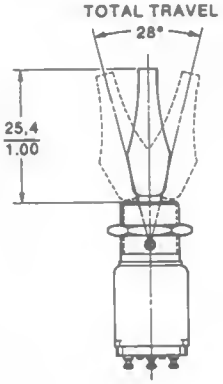
3 - POSITION ORDER GUIDE — IWTS TERMINATION

No. Poles	Circuits Made with Toggle at: Keyway Position	Circuits Made with Toggle at: Center Position	Circuits Made with Toggle at: Opposite Keyway	Standard Toggle Catalog Listing	Pull-to-Unlock Toggle Add Suffix to Standard Listing
1	2-1 ON	OFF	2-3 ON	111TW1-1	ALL
1	2-1 ON*	OFF	2-3 ON	111TW1-5	E, F, K, L, M, N
1	2-1 ON*	OFF	2-3 ON*	111TW1-7	E, L, N
2	2-1 & 5-4 ON	OFF	2-3 & 5-6 ON	112TW1-1	ALL
2	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON	112TW1-5	E, F, K, L, M, N
2	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON*	112TW1-7	E, L, N

* These positions only are momentary. All others are maintained.

Manual Switches

Miniature Toggle Switches



WITH COLORED TAB LEVERS

- Available in seven colors
- Affords attractive front-of-panel appearance for graphic display and functional identify
- Levers made to withstand temperatures up to 160°F (71°C)
- Switches furnished with decorative knurled nut, a lockwasher, a keying washer, and a hex nut
- 15⁄32″ bushing has lever seal
- Solder terminals (available with IWTS termination)

ORDER GUIDE

To order, combine the basic (function) listing from Table 1 with the desired lever color suffix from Table 2.

Colored tab levers are not available with ¼ in. bushing.

TABLE 1 — TOGGLE POSITION AND CONTACT ARRANGEMENT

Positions	No. Poles	Circuits Made with Toggle at: Keyway Position	Center Position	Opposite Keyway	Basic Listing Add color suffix from Table 2.
2	1	OFF	NONE	2-3 ON	11TW19-2 –
2	1	2-1 ON	NONE	2-3 ON	11TW19-3 –
2	1	2-1 ON*	NONE	2-3 ON	11TW19-8 –
2	2	OFF	NONE	2-3 & 5-6 ON	12TW19-2 –
2	2	2-1 & 5-4	NONE	2-3 & 5-6 ON	12TW19-3 –
2	2	2-1 & 5-4*	NONE	2-3 & 5-6 ON	12TW19-8 –
3	1	2-1 ON	OFF	2-3 ON	11TW19-1 –
3	1	2-1 ON*	OFF	2-3 ON	11TW19-5 –
3	1	2-1 ON*	OFF	2-3 ON*	11TW19-7 –
3	2	2-1 & 5-4 ON	OFF	2-3 & 5-6 ON	12TW19-1 –
3	2	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON	12TW19-5 –
3	2	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON*	12TW19-7 –

* These positions only are momentary. All others are maintained.

TABLE 2 — TAB LEVER COLORS

Tab Lever Color	White	Black	Blue	Red	Green	Orange	Light Gray
Color suffix	A001	A002	A003	A004	A005	A006	A007

TW SWITCHES WITH SPECIAL CIRCUITRIES

All 2-pole 3-position TW switches are available with special "on-on-on" **–10, –50, –70** circuitry options as shown below.

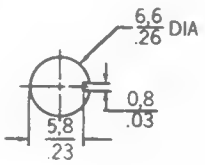
2-Pole 3-Position Switches			Sealed Standard Toggle		Unsealed Std. Toggle	Sealed Tab Lever
Circuits Made With Toggle At:			15⁄32″ bushing	¼″ bushing	¼″ bushing	15⁄32″ bushing
Keyway Position	Center Position	Opposite Keyway	Catalog Listing	Catalog Listing	Catalog Listing	Catalog Listing Add color suffix from Table 2
2-1 & 5-4 ON	2-1 & 5-6 ON	2-3 & 5-6 ON	12TW1-10	2TW101-10	2TW1-10	12TW19-10 –
2-1 & 5-4 ON*	2-1 & 5-6 ON	2-3 & 5-6 ON	12TW1-50	2TW101-50	2TW1-50	12TW19-50 –
2-1 & 5-4 ON*	2-1 & 5-6 ON	2-3 & 5-6 ON*	12TW1-70	2TW101-70	2TW1-70	12TW19-70 –

* These positions are momentary. All others are maintained.

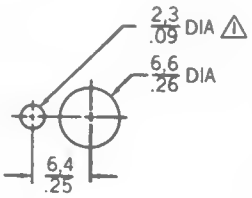
Manual Switches
Miniature Toggle Switches

MOUNTING DIMENSIONS (For reference only)

Mounting detail for ¼" bushing switches

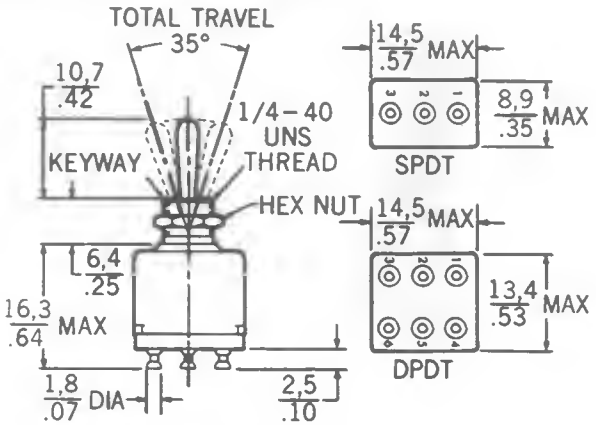


Without locking ring

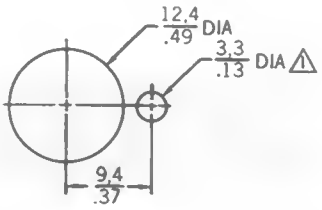


With locking ring

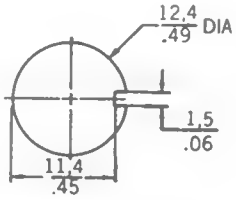
Dimensions for ¼" bushing switches



Mounting detail for 15/32" bushing switches



With locking ring



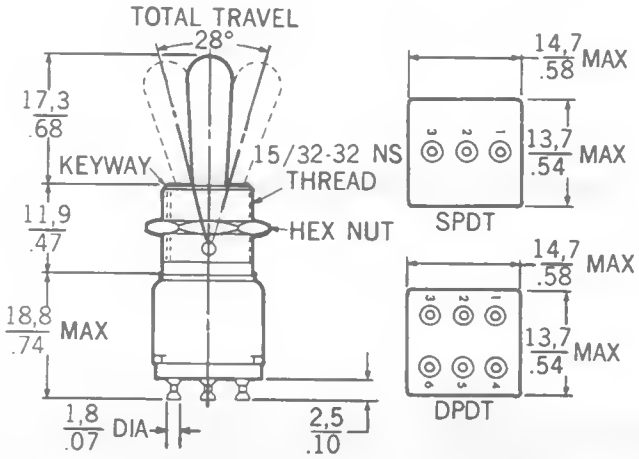
Without locking ring

Note: ⚠ 1,1/.05 MIN. DEEP TO ACCOMMODATE LOCKING RING.
FOR SWITCHES USING PANEL SEAL, DO NOT ALLOW THRU HOLE MOUNTING.

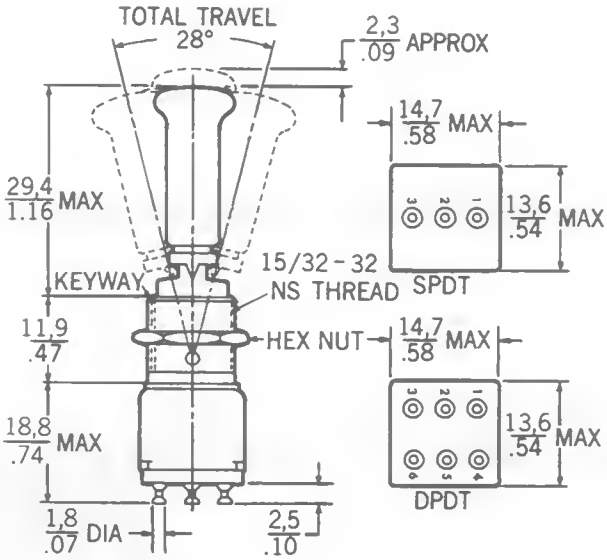
Key: 0,0 = mm / 0.00 = inches

Dimensions for 15/32" switches

Standard toggle lever

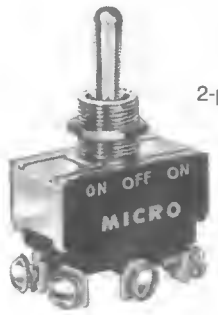


Pull-to-unlock toggle lever



Bushing mounting torque is 10–15 in./lbs.

Manual Switches
Toggle Switches



2-pole shown

ELECTRICAL RATINGS

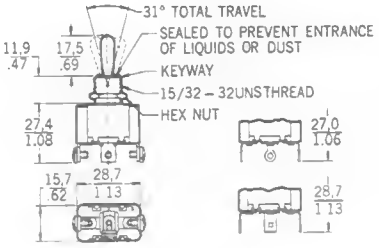
UL/CSA Rating Code	Electrical Rating
L192	10 Amps, 125, 250, 277 VAC ¼ HP, 125 VAC ½ HP, 250, 277 VAC 3 Amps, 125 VAC "L"
L191	15 Amps, 125, 250, 277 VAC ½ HP, 125 VAC 1 HP, 250, 277 VAC 5 Amps, 125 VAC (L)

FEATURES
- 2 or 3-position, momentary and maintained action.
- 1 and 2-pole circuitry.
- Rated up to 15 amps.
- Lever-to-bushing seal.
- Solder, screw, or quick-connect terminals.
- UL recognized, CSA certified.
- CE approved

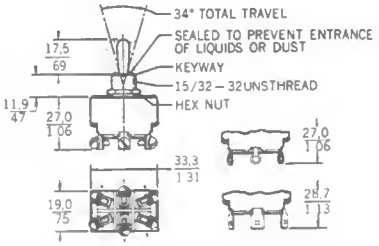
Colored sleeves for levers (not shown) can also be furnished. See page 149.

MOUNTING DIMENSIONS (For reference only)

1-pole



2-pole



TERMINAL CIRCUIT IDENTIFICATION
Terminal identifications are referred to in the Ordering Charts to indicate which circuits are made in each toggle position (i.e., 1-2 reference indicates circuit closure through terminals 1 and 2).

Application Note: Honeywell MICRO SWITCH does *not* recommend the use of silver cadmium oxide switch contacts in non-arcing loads. Non-arcing loads are generally loads less than 12 volts and/or 0.5 amp. TS switches use silver cadmium oxide contacts. If you have questions, contact the MICRO SWITCH Application Center at 1-800-537-6945.

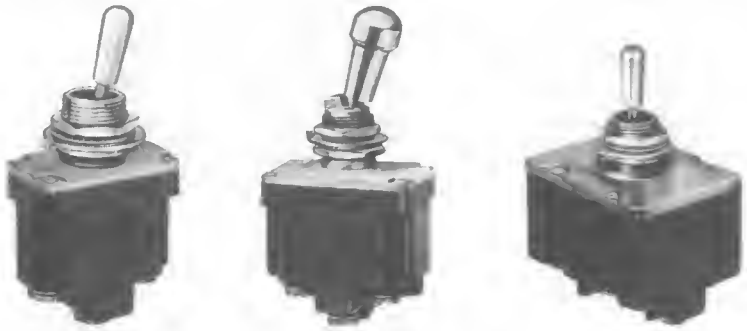
2-POSITION ORDER GUIDE

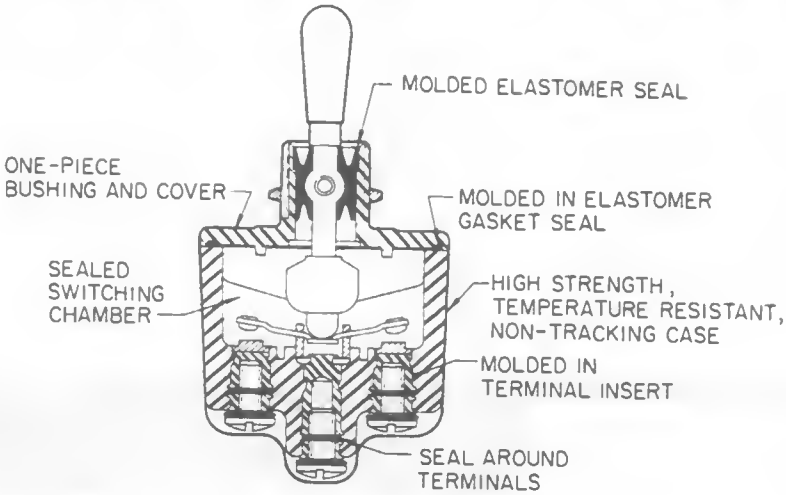
No. Of Poles	Circuit(s) Made With Toggle At: Keyway Position	Opposite Keyway	UL/CSA Rating Code	Screw Terminals	Solder Terminals	Quick-Connect Terminals
1	OFF	2-3 ON	L191	11TS15-2	11TS115-2	11TS95-2
	2-1 ON	2-3 ON	L191	11TS15-3	11TS115-3	11TS95-3
	OFF*	2-3 ON	L192	11TS15-4	11TS115-4	11TS95-4
	2-1 ON*	OFF	L192	11TS15-6	11TS115-6	11TS95-6
	2-1 ON*	2-3 ON	L192	11TS15-8	11TS115-8	11TS95-8
2	OFF	2-3 & 5-6 ON	L191	12TS15-2	12TS115-2	12TS95-2
	2-1 & 5-4 ON	2-3 & 5-6 ON	L191	12TS15-3	12TS115-3	12TS95-3
	OFF*	2-3 & 5-6 ON	L192	12TS15-4	12TS115-4	12TS95-4
	2-1 & 5-4 ON*	OFF	L192	12TS15-6	12TS115-6	12TS95-6
	2-1 & 5-4 ON*	2-3 & 5-6 ON	L192	12TS15-8	12TS115-8	12TS95-8

3-POSITION ORDER GUIDE

No. Of Poles	Circuit(s) Made With Toggle At: Keyway Position	Center Position	Opposite Keyway	UL/CSA Rating Code	Screw Terminals	Solder Terminals	Quick-Connect Terminals
1	2-1 ON	OFF	2-3 ON	L191	11TS15-1	11TS115-1	11TS95-1
	NONE	OFF	2-3 ON	L191	11TS15-21	—	11TS95-21
	2-1 ON*	OFF	2-3 ON	L192	11TS15-5	11TS115-5	11TS95-5
	2-1 ON*	OFF	NONE	L192	11TS15-61	—	11TS95-61
	2-1 ON*	OFF	2-3 ON*	L192	11TS15-7	11TS115-7	11TS95-7
2	2-1 & 5-4 ON	OFF	2-3 & 5-6 ON	L191	12TS15-1	12TS115-1	12TS95-1
	NONE	OFF	2-3 & 5-6 ON	L191	12TS15-21	12TS115-21	12TS95-21
	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON	L192	12TS15-5	12TS115-5	12TS95-5
	2-1 & 5-4 ON*	OFF	NONE	L192	12TS15-61	12TS115-61	12TS95-61
	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON*	L192	12TS15-7	12TS115-7	12TS95-7
	2-1 & 5-4 ON	2-1 & 5-6 ON	2-3 & 5-6 ON	L191	—	12TS115-10	12TS95-10

* Marked toggle positions are momentary. All other positions are maintained.





FEATURES

- Qualified to MIL-S-3950
- Environment-proof sealing
- 1, 2, and 4 pole circuitry.
- Standard and pull to unlock levers.
- 2 and 3 position, maintained, and momentary toggle action.
- Temperature range: –85°F to +160°F (–65°C to +71°C).
- UL recognized, CSA certified.
- CE approved

CONSTRUCTION

TL's have high strength, temperature resistant, non-tracking case material and silver cadmium oxide contacts.

ACTUATOR OPTIONS

Standard toggle lever operates on a direct action spring loaded toggle mechanism to provide excellent tactile feedback in both the momentary and maintained toggle positions. The toggle lever is approximately .68 in. (16 mm) long and has a non-glare matte nickel plated finish.

Pull-to-unlock toggle levers prevent accidental toggle movement. The knobbed toggle lever must be pulled out approximately .09 in. (2,3 mm) to change positions. Thirteen different locking configurations are available. This lever style also has a non-glare matte nickel finish.

Colored tab levers (not shown) can also be furnished. They have the same appearance as the tab lever shown in the TW photo on page 133. Call the 800 number.

ELECTRICAL RATINGS

(In amperes)

Elec. Rating Code	28 VDC			115 VDC	250 VDC	115 VAC 60 & 400 Hz			230 VAC
	Ind.	Res.	Lamp	Res.	Res.	Ind.	Res.	Lamp	Res.
1	15	20	5	0.75	0.5	10	15	3	6
2	10	15	4	0.75	0.5	7	15	2	6
3	15	20	7	0.75	0.5	15	15	4	6
4	10	18	5	0.75	0.5	8	11	2	6
5	12	20	5	0.75	0.5	15	15	4	6
6	10	18	4	0.75	0.5	8	11	2	6

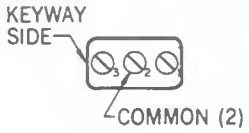
UL/CSA Rating Code	Electrical Rating
L192	10 amps–125, 250, 277 VAC; ¼ Hp-125 VAC; ½ Hp-250, 277 VAC 3 amps-125 VAC "L"
L191	15 amps–125, 250, 277 VAC; ½ Hp-125 VAC; 1 Hp-250, 277 VAC 5 amps-120 VAC "L"

Application Note: Honeywell MICRO SWITCH does *not* recommend the use of silver cadmium oxide switch contacts in non-arcing loads. Non-arcing loads are generally loads less than 12 volts and/or 0.5 amp. TL switches use silver cadmium oxide contacts. For other options, contact the MICRO SWITCH Application Center at 1-800-537-6945.

TERMINAL CIRCUIT IDENTIFICATION

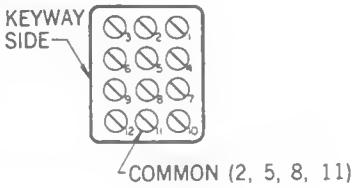
Terminal identifications are referred to in the order guides to indicate which circuits are made in each toggle position (i.e., 1-2 refers to circuit closure through terminals 1 and 2).

One pole



Two pole

Four pole



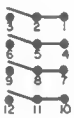
TERMINALS

In addition to the screw terminal switches listed in the order guides, IWTS Integrated Wire Termination System versions (covered in MICRO SWITCH Catalog 80) and solder turret terminals are available. Contact the 800 number.

SPECIAL CIRCUITRIES

Catalog listings with -10, -50, and -70 suffix numbers shown in the order guides have special "On-On-On" circuits, as illustrated. TLs with -12 suffix are the same as -50 except the keyway position is maintained, and in the center position circuits 2-3 and 4-5 are made.

–10 CIRCUITRY

No. of Poles	Keyway Side Maint. Position	Center Maint. Position	Opposite Keyway Maint. Position
2			
4			

–50 CIRCUITRY

No. of Poles	Keyway Side Mom. Position	Center Maint. Position	Opposite Keyway Maint. Position
2			
4			

–70 CIRCUITRY

No. of Poles	Keyway Side Mom. Position	Center Maint. Position	Opposite Keyway Mom. Position
2			
4			

ACCESSORIES

Colored lever sleeves, decorative mounting hardware, and panel seal accessories are shown on page 149.

2-POSITION ORDER GUIDE

	No. of Poles	Circuit(s) Made With Toggle At: Keyway Position	Circuit(s) Made With Toggle At: Opposite Keyway	Electrical Rating Code	UL/CSA Rating Code	Standard Toggle: Catalog Listing	Standard Toggle: Military Number	Pull-to-Unlock Toggle: Add Suffix to Standard Toggle Listing	Pull-to-Unlock Toggle: Military Number **
	1	OFF	2-3	1	L191	1TL1-2	MS24523-22	D, F, G	MS24658-22
		OFF*	2-3	2	L192	1TL1-4	MS24523-29	F	MS24658-29
		1-2*	OFF	2	L192	1TL1-6	MS24523-30	F	MS24658-30
		1-2	2-3	1	L191	1TL1-3	MS24523-23	D, F, G	MS24658-23
		1-2*	2-3	2	L192	1TL1-8	MS24523-26	F	MS24658-26
	2	OFF	2-3, 5-6	3	L191	2TL1-2	MS24524-22	D, F, G	MS24659-22
		OFF*	2-3, 5-6	4	L192	2TL1-4	MS24524-29	F	MS24659-29
		1-2, 4-5*	OFF	4	L192	2TL1-6	MS24524-30	F	MS24659-30
		1-2, 4-5	2-3, 5-6	3	L191	2TL1-3	MS24524-23	D, F, G	MS24659-23
		1-2. 4-5*	2-3, 5-6	4	L192	2TL1-8	MS24524-26	F	MS24659-26
	4	OFF	2-3, 5-6 8-9, 11-12	5	L191	4TL1-2	MS24525-22	D, F, G	MS24660-22
		OFF*	2-3, 5-6 8-9, 11-12	6	L192	4TL1-4	MS24525-29	F	MS24660-29
		1-2, 4-5 7-8, 10-11*	OFF	6	L192	4TL1-6	MS24525-30	F	MS24660-30
		1-2, 4-5 7-8, 10-11	2-3, 5-6 8-9, 11-12	5	L191	4TL1-3	MS24525-23	D, F, G	MS24660-23
		1-2, 4-5* 7-8, 10-11	2-3, 5-6 8-9, 11-12	6	L192	4TL1-8	MS24525-26	F	MS24660-26

* These positions only are momentary. All others are maintained.
** Also add the appropriate suffix letter to the Military number.

PULL-TO-UNLOCK OPTION

When ordering pull-to-unlock toggle listings, add the suffix letter shown in the chart below to the standard toggle listing and the MS number. For example, to order a 1TL1-1 pull-to-unlock toggle switch with the lever locked in the center position, add the letter **E**; i.e., 1TL1-1**E**, MS-24658-21**E**.

LOCKING CONFIGURATIONS

A	B	D	E	F	G	H
Locked In Three Positions	Locked In Center and Extreme Position (Keyway Side)	Locked Out Of Center Position	Locked In Center Position	Locked In Extreme Position (Opposite Keyway)	Locked In Extreme Position (Keyway Side)	Locked Out Of Center And Extreme Position (Keyway Side)

J	K	L	M	N	P
Locked Out Of Center And Extreme Position (Opposite Keyway)	Locked In Center And Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Keyway Side)	Locked Out Of And Into Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Opposite Keyway)	Locked Out Of And Into Extreme Position (Keyway Side)

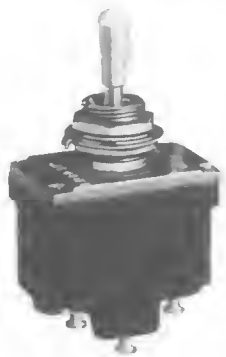
Manual Switches
Toggle Switches

3-POSITION ORDER GUIDE

	No. of Poles	Circuit(s) Made With Toggle At: Keyway Position	Center Position	Opposite Keyway	Elec. Rating Code	UL/CSA Rating Code	Standard Toggle: Catalog Listing	Military Number***	Pull-to-Unlock Toggle: Add Suffix to Standard Toggle Listing	Military Number***
	1	1-2	OFF	2-3	1	L191	1TL1-1	MS24523-21	ALL TYPES	MS24658-21
		1-2*	OFF	2-3	2	L192	1TL1-5	MS24523-31	E, F, K, L, M, N	MS24658-31
		1-2*	OFF	2-3*	2	L192	1TL1-7	MS24523-27	E, L, N	MS24658-27
		None**	OFF	2-3	1	L191	1TL1-21	MS24523-24	E, F, K, M	MS24658-24
		None**	1-2	2-3	1	L192	1TL1-31	MS24523-33	E, F, K, M	MS24658-33
		None**	1-2	2-3*	2	L192	1TL1-51	MS24523-32	E	MS24658-32
		1-2*	OFF	None**	2	L192	1TL1-61	MS24523-28	E	MS24658-28
	2	1-2, 4-5	OFF	2-3, 5-6	3	L191	2TL1-1	MS24524-21	ALL TYPES	MS24659-21
		1-2, 4-5*	OFF	2-3, 5-6	4	L192	2TL1-5	MS24524-31	E, F, K, L, M, N	MS24659-31
		1-2, 4-5*	OFF	2-3, 5-6*	4	L192	2TL1-7	MS24524-27	E, L, N	MS24659-27
		None**	OFF	2-3, 5-6	3	L191	2TL1-21	MS24524-24	E, F, K, M	MS24659-24
		None**	1-2, 4-5	2-3, 5-6	3	L191	2TL1-31	MS24524-33	E, F, K, M	MS24659-33
		None**	1-2, 4-5	2-3, 5-6*	4	L192	2TL1-51	MS24524-32	E	MS24659-32
		1-2, 4-5*	OFF	None**	4	L192	2TL1-61	MS24524-28	E	MS24659-28
		1-2, 4-5	1-2, 5-6	2-3, 5-6	3	L191	2TL1-10	MS27407-4	ALL TYPES	MS27408-4
		1-2, 4-5*	1-2, 5-6	2-3, 5-6	4	L192	2TL1-50	MS27407-5	E, F, K, L, M, N	MS27408-5
		1-2, 4-5*	1-2, 5-6	2-3, 5-6*	4	L192	2TL1-70	MS27407-6	E, L, N	MS27408-6
	4	1-2, 4-5 7-8, 10-11	OFF	2-3, 5-6 8-9, 11-12	5	L191	4TL1-1	MS24525-21	ALL TYPES	MS24660-21
		1-2, 4-5 7-8, 10-11*	OFF	2-3, 5-6 8-9, 11-12	6	L192	4TL1-5	MS24525-31	E, F, K, L, M, N	MS24660-31
		1-2, 4-5 7-8, 10-11*	OFF	2-3, 5-6 8-9, 11-12*	6	L192	4TL1-7	MS24525-27	E, L, N	MS24660-27
		None**	OFF	2-3, 5-6 8-9, 11-12	5	L191	4TL1-21	MS24525-24	E, F, K, M	MS24660-24
		None**	1-2, 4-5 7-8, 10-11	2-3, 5-6 8-9, 11-12	5	L191	4TL1-31	MS24525-33	E, F, K, M	MS24660-33
		None**	1-2, 4-5 7-8, 10-11	2-3, 5-6 8-9, 11-12*	6	L192	4TL1-51	MS24525-32	E	MS24660-32
		1-2, 4-5 7-8, 10-11*	OFF	None**	6	L192	4TL1-61	MS24525-38	E	MS24660-28
		1-2, 4-5 7-8, 10-11	2-3, 4-5	2-3, 5-6 8-9, 11-12	5	L191	4TL1-10	—	ALL TYPES	—
		1-2, 4-5 7-8, 10-11*	2-3, 4-5 7-8, 11-12	2-3, 5-6 8-9, 11-12	6	L192	4TL1-50	MS27406-2	E, F, K, L, M, N	MS27409-2
		1-2, 4-5 7-8, 10-11*	2-3, 4-5	2-3, 5-6 8-9, 11-12*	6	L192	4TL1-70	—	E, L, N	—
		1-2, 4-5 7-8, 10-11	2-3, 4-5 7-8, 11-12	2-3, 5-6 8-9, 11-12	5	L191	4TL1-12	MS27406-1	ALL TYPES	MS27409-1
		1-2, 4-5 7-8, 10-11*	2-3, 4-5 7-8, 11-12	2-3, 5-6 8-9, 11-12*	6	L192	4TL1-72	MS27406-3	E, L, N	MS27409-3

* These positions only are momentary. All others are maintained.
** Toggle lever is blocked from these positions. Toggle becomes two position, with center being one extreme position.
***Also add appropriate suffix letter to the Military Number.

SOLDER TURRET TERMINAL VERSION

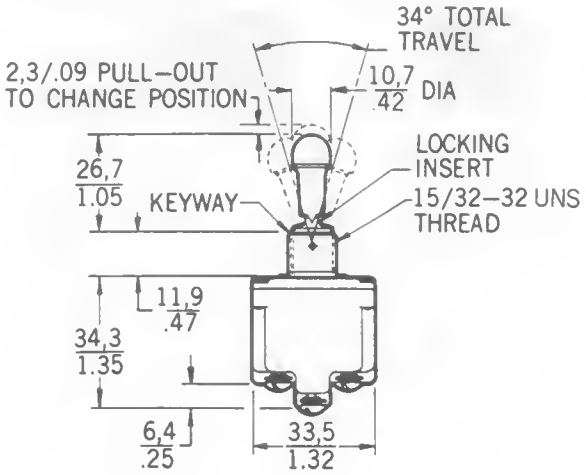


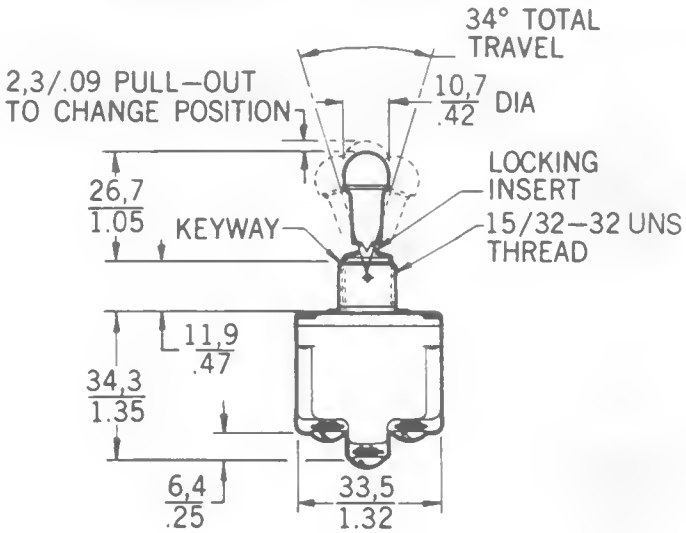
HOW TO ORDER

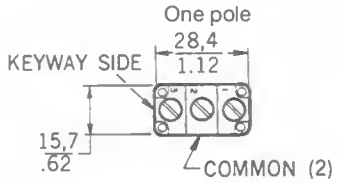
11TL, 12TL, and 14TL type switches with solder turret terminals are qualified to MIL-S-3950. They have the same circuitry and electrical ratings as their 1TL, 2TL, and 4TL counterparts. For example, 11TL1-2 is the same as 1TL1-2, except it has solder turret terminals instead of screw terminals. The complete MS drawing numbers are shown in data sheet 204.

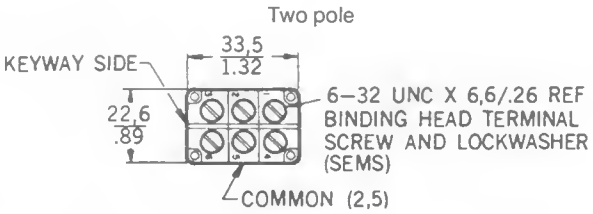
Circuitry	Type	Std. Lever	Lever Lock
One Pole	11TL	MS27734	MS27737
Two Pole	612TL	MS27735	MS27738
Four Pole	14TL	MS27736	MS27739

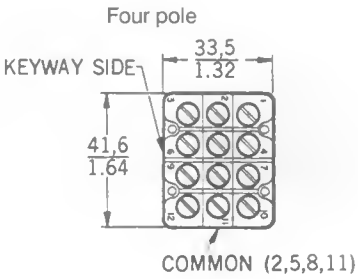
MOUNTING DIMENSIONS (For reference only)







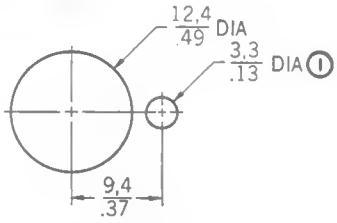




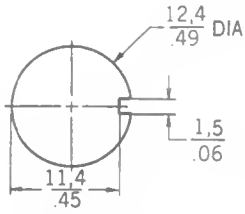
Note:
Terminal screws, and mounting hardware (locking ring, lockwasher, and two hexnuts) are furnished unassembled.

Key: 0,0 = mm / 0.00 = inches

Panel cutout



With locking ring



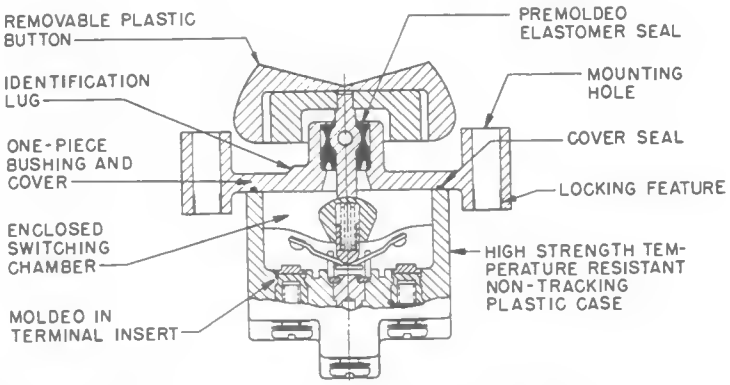
Without locking ring

Bushing mounting torque is 10–15 in./lbs.
Terminal screw mounting torque is 5 in./lbs. max.

Note:
① 1,4/.06 MIN DEEP TO ACCOMMODATE LOCKING RING. 15PA87 PANEL SEAL REQUIRES BLIND HOLE TO INSURE SEAL INTEGRITY

Manual Switches

Rocker Button Switches



UL/CSA Rating Code	Electrical Rating
L192	10 amps-125, 250, 277 VAC; ¼ Hp-125 VAC; ½ Hp-250, 277 VAC 3 Amps-125 VAC "L"
L191	15 amps-125, 250, 277 VAC: ½ Hp-125 VAC; 1Hp-250, 277 VAC 5 amps-120 VAC "L"

Application Note: Honeywell MICRO SWITCH does *not* recommend the use of silver cadmium oxide switch contacts in non-arcing loads. Non-arcing loads are generally loads less than 12 volts and/or 0.5 amp. TP switches use silver cadmium oxide contacts. For other options, contact the MICRO SWITCH Application Center at 1-800-537-6945.

FEATURES

- 2 and 3 position pushbutton action
- Various button colors
- 1, 2, and 4 pole circuitry
- Flush panel and above panel mounting
- Temperature range is from –65°F to +160°F (–54°C to +71°C)
- UL recognized, CSA certified
- CE approved

CONSTRUCTION

Above panel mounting gives a distinct button appearance. Flush panel mounting presents a low button profile.

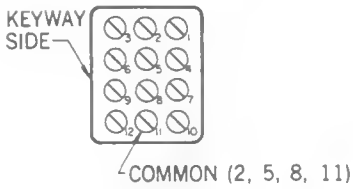
TERMINAL CIRCUIT IDENTIFICATION

Terminal identifications are referred to in the order guides to indicate which circuits are made in each toggle position (i.e., 1-2 indicates circuit closure through terminals 1 and 2).

One pole

Two pole

Four pole



Manual Switches
Rocker Button Switches

Typical two-pole flush panel translucent button switch

Typical one-pole above panel transparent button switch

BUTTON OPTIONS

Buttons are removable and interchangeable. They measure .87″ × 1.46″ (22,1 × 37,1 mm).

Transparent (colorless plastic) buttons accept under-the-surface legend inserts for station and function identification. **Legend inserts are not furnished.** Insert legending can be done by your local supplier.

Translucent (white plastic) buttons have a clear appearance.

Colored (opaque plastic) buttons are excellent for color coding switch functions.

SWITCHES WITHOUT BUTTONS

To order switches without buttons, convert catalog listings shown in the order guides. Substitute **TP7** for TP4 and TP16 above panel mounted switches; substitute **TP8** for TP201 and TP12 flush panel mounted switches. Order buttons separately from the chart below.

BUTTON ORDER GUIDE

Color	Catalog Listing
Translucent	12PA6
Transparent	12PA4
White*	12PA5-W
Yellow*	12PA5-Y
Black*	12PA5-BK
Green*	12PA5-G
Red*	12PA5-R
Blue*	12PA5-BL

* Opaque

2-POSITION ORDER GUIDE

Furnished with buttons.

No. of Poles	Circuits Made with Button at: Ident. Lug Position	Circuits Made with Button at: Opposite Ident. Lug	UL/CSA Rating Code	Elec. Rating Code	Catalog Listings: Flush Panel Translucent Button	Catalog Listings: Flush Panel Transparent Button	Catalog Listings: Above Panel Translucent Button	Catalog Listings: Above Panel Transparent Button
1	OFF	2-3	L191	1	1TP201-2	1TP12-2	1TP216-2	1TP4-2
	OFF*	2-3	L192	2	1TP201-4	—	—	—
	1-2*	OFF	L192	2	1TP201-6	1TP12-6	—	1TP4-6
	1-2	2-3	L191	1	1TP201-3	1TP12-3	1TP216-3	1TP4-3
	1-2*	2-3	L192	2	1TP201-8	1TP12-8	1TP216-8	—
2	OFF	2-3, 5-6	L191	3	2TP201-2	2TP12-2	2TP216-2	2TP4-2
	1-2,4-5	2-3, 5-6	L191	3	2TP201-3	2TP12-3	2TP216-3	2TP4-3
	1-2,4-5*	2-3, 5-6	L192	4	2TP201-8	2TP12-8	2TP216-8	2TP4-8
4	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4TP201-2	4TP12-2	—	—
	OFF*	2-3, 5-6, 8-9, 11-12	L192	6	—	—	4TP216-4	—
	1-2, 4-5, 7-8, 10-11	2-3, 5-6, 8-9, 11-12	L191	5	4TP201-3	4TP12-3	4TP216-3	4TP4-3
	1-2, 4-5, 7-8, 10-11*	2-3, 5-6, 8-9, 11-12	L192	6	—	—	4TP216-8	—

* These positions only are momentary. All others are maintained.

Manual Switches
Rocker Button Switches

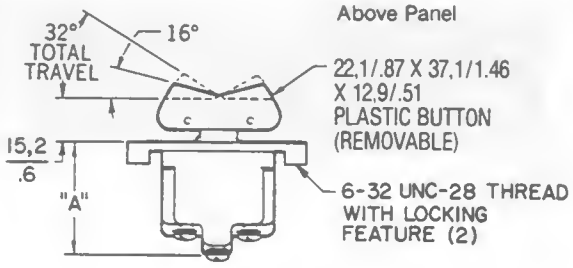
3 - POSITION ORDER GUIDE
Furnished with buttons.

No. of Poles	Circuits Made with Button at: Ident. Lug Position	Center Position	Opposite Lug Position	UL/CSA Rating Code	Elec. Rating Code	Catalog Listings: Flush Panel Translucent Button	Flush Panel Transparent Button	Above Panel Translucent Button	Above Panel Transparent Button
1	1-2	OFF	2-3	L191	1	1TP201-1	1TP12-1	1TP216-1	1TP4-1
	1-2*	OFF	2-3	L192	2	1TP201-5	1TP12-5	1TP216-5	1TP4-5
	1-2*	OFF	2-3*	L192	2	1TP201-7	1TP12-7	1TP216-7	1TP4-7
	NONE**	OFF	2-3	L191	1	1TP201-21	1TP12-21	—	1TP4-21
	NONE**	1-2	2-3	L191	1	1TP201-31	1TP12-31	—	1TP4-31
	NONE**	1-2	2-3*	L192	2	1TP201-51	1TP12-51	1TP216-51	1TP4-51
	1-2*	OFF	NONE**	L192	2	1TP201-61	1TP12-61	1TP216-61	1TP4-61
2	1-2, 4-5	OFF	2-3, 5-6	L191	3	2TP201-1	2TP12-1	2TP216-1	2TP4-1
	1-2, 4-5*	OFF	2-3, 5-6	L192	4	2TP201-5	2TP12-5	2TP216-5	2TP4-5
	1-2, 4-5*	OFF	2-3, 5-6*	L192	4	2TP201-7	2TP12-7	2TP216-7	2TP4-7
	NONE**	OFF	2-3, 5-6	L191	3	2TP201-21	2TP12-21	2TP216-21	2TP4-21
	NONE**	1-2, 4-5	2-3, 5-6	L191	3	2TP201-31	2TP12-31	2TP216-31	2TP4-31
	NONE**	1-2, 4-5	2-3, 5-6*	L192	4	2TP201-512	2TP12-512	2TP216-512	2TP4-512
	1-2, 4-5*	OFF	NONE**	L192	4	2TP201-61	2TP12-61	2TP216-61	2TP4-61
	1-2, 4-5	1-2, 5-6	2-3, 5-6	L191	3	2TP201-10†	2TP12-10	2TP216-10	2TP4-10
	1-2, 4-5*	1-2, 5-6	2-3, 5-6	L192	4	2TP201-50†	2TP12-50	2TP216-50	2TP4-50
	1-2, 4-5*	1-2, 5-6	2-3, 5-6*	L192	4	2TP201-70†	2TP12-70	2TP216-70	2TP4-70
4	1-2, 4-5, 7-8, 10-11	OFF	2-3, 5-6 8-9, 11-12	L191	5	4TP201-1	4TP12-1	4TP216-1	4TP4-1
	1-2, 4-5 7-8, 10-11*	OFF	2-3, 5-6 8-9, 11-12	L192	6	4TP201-5	4TP12-5	—	4TP4-5
	1-2, 4-5, 7-8, 10-11*	OFF	2-3, 5-6 8-9, 11-12*	L192	6	4TP201-7	4TP12-7	4TP216-7	4TP4-7
	NONE**	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4TP201-21	4TP12-21	4TP216-21	4TP4-21
	NONE**	1-2, 4-5 7-8, 10-11	2-3, 5-6, 8-9, 11-12	L191	5	4TP201-31	—	4TP216-31	4TP4-31
	NONE**	1-2, 4-5 7-8, 10-11	2-3, 5-6 8-9, 11-12*	L192	6	4TP201-51	—	4TP216-51	4TP4-51
	1-2, 4-5, 7-8, 10-11*	OFF	NONE**	L192	6	4TP201-61	4TP12-61	4TP216-61	4TP4-61
	1-2, 4-5, 7-8, 10-11	2-3, 4-5	2-3, 5-6, 8-9, 11-12	L191	5	4TP201-10†	4TP12-10	—	4TP4-10
	1-2, 4-5, 7-8, 10-11*	2-3, 4-5 7-8, 11-12	2-3, 5-6, 8-9, 11-12	L192	6	4TP201-50†	4TP12-50	4TP216-50	4TP4-50
	1-2, 4-5, 7-8, 10-11*	2-3, 4-5	2-3, 5-6, 8-9, 11-12*	L192	6	4TP201-70†	4TP12-70	4TP216-70	4TP4-70

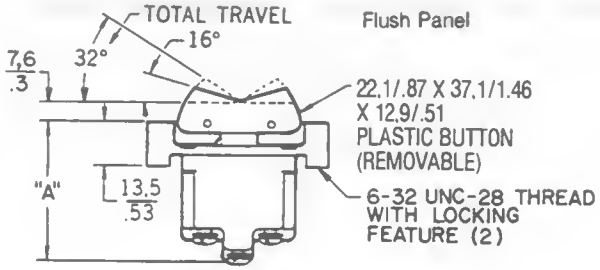
*These positions only are momentary. All others are maintained.
**Operator is blocked from these positions. Switch becomes two position, with center being one extreme position.
† Special on-on-on circuitry. See page 137.

Manual Switches
Rocker Button Switches

MOUNTING DIMENSIONS (For reference only)

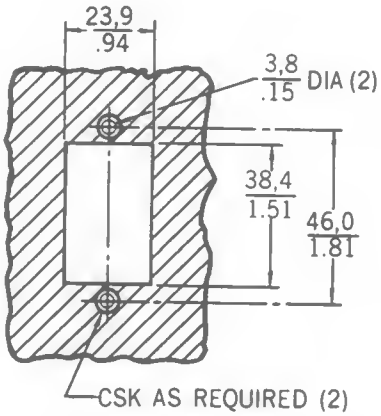


	DIM. "A"
1-POLE	29,5 / 1.16
2 & 4-POLE	34,4 / 1.35

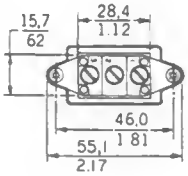


	DIM. "A"
1-POLE	36,8 / 1.45
2 & 4-POLE	41,7 / 1.64

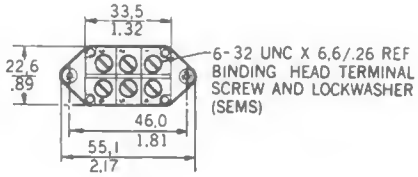
Panel cutout



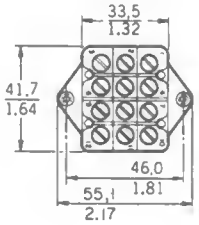
One pole



Two pole



Four pole



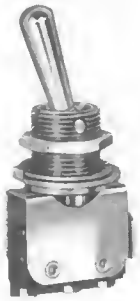
Key: 0,0 = mm / 0.00 = inches

Flange mounting torque is 10–12 in./lbs.
Terminal screw mounting torque is 5 in./lbs. max.

Manual Switches

Toggle Switch Assemblies

6AT SERIES



FEATURES

- 2-position, momentary and maintained action.
- 1, 2 or 3 SPDT precision basic switches.
- Short behind-panel depth.
- Choice of ¼ or 15⁄32-inch bushings.
- Silver or gold contacts.
- UL recognized, CSA certified basic switches.

ELECTRICAL RATINGS — Basic Switches

	UL/CSA Rating	30 VDC Rating		
		Load	Amps	
			Sea Level	50,000 ft.
Silver Contacts	5 amps, 125-250 VAC	Inductive Resistive Max. Inrush	3 5 24	2.5 5 24
Gold Contacts	1 amp, 125 VAC	Inductive Resistive Max. Inrush	0.5 1 2	0.5 1 2

2-POSITION ORDER GUIDE

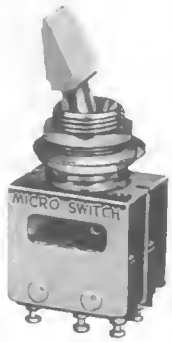
Mounting Style	Toggle Lever Position		Number of Poles	Types Contacts	Solder Terminals	"T" Terminals	"T2" Terminals
	Keyway	Opposite Keyway					
¼" Bushing With Key Tab	Maint.	Maint.	1	Silver	6AT2	6AT2-T 6AT68-T*	6AT2-T2 6AT68-T2*
				Gold	6AT23		6AT23-T2
			2	Silver	6AT3	6AT3-T	6AT3-T2
				Gold	—	6AT13-T	6AT13-T2
			3	Silver	6AT501	6AT501-T	
¼" Bushing Without Key Tab	Maint.	Maint.	1	Silver	6AT1	6AT1-T	6AT1-T2
				Gold			6AT56-T2
			2	Silver	6AT4	—	6AT4-T2
¼" Bushing With Key Washer	Maint.	Maint.	1	Silver		6AT201-T	
			2	Gold			6AT231-T2
15⁄32" Bushing With Key Washer	Maint.	Maint.	1	Silver	6AT6	6AT6-T	6AT6-T2
				Gold	6AT17		6AT17-T2
			2	Silver	6AT7	6AT7-T	
				Gold	6AT42		6AT42-T2
			3	Silver	6AT10	6AT10-T	6AT10-T2
				Gold	6AT18		6AT18-T2

* Extra long toggle lever (.67"/17,0 mm).

Manual Switches
Toggle Switch Assemblies

13AT/23AT SERIES

Standard lever



Tab lever

Pull-to-unlock lever

FEATURES
- 2 or 3-position, momentary and maintained action.
- 2, 3 or 4 SPDT precision basic switches.
- Standard toggle, tab, or pull-to-unlock levers.
- Silver or gold contacts.
- 15/32-inch bushing.
- UL recognized, CSA certified basic switches.
- Lever-to-bushing seal option.

ELECTRICAL RATINGS — Basic Switches

	UL/CSA Rating	30 VDC Rating		
			Amps	
		Load	Sea Level	50,000 ft.
Silver Contacts	5 amps, 125-250 VAC	Inductive Resistive Max. Inrush	3 5 24	2.5 5 24
Gold Contacts	1 amp, 125 VAC	Inductive Resistive Max. Inrush	0.5 1 2	0.5 1 2

PULL-TO-UNLOCK TOGGLE LEVERS

As a guard against accidental operation, pull-to-unlock toggle levers must be pulled .090 inch/2, 3 mm (approx.) to change positions. A chart showing the 13 locking configurations and their catalog listing suffix code letters is shown on next page.

2-POSITION ORDER GUIDES

Keyway	Opposite Keyway	No. of Poles	Type Contacts	Standard Lever Solder Terminals	Standard Lever "T" Terminals	Standard Lever "T2" Terminals	Tab Lever "T2" Terminals	Pull-To-Unlock Lever Solder Terminals (Add locking letter ① to cat. listings below)	
Maint.	Maint.	2	Silver	23AT1	23AT1-T	23AT1-T2	23AT402-T2	23AT1-	Locking letters: D, F, or G
			Gold	23AT11		23AT11-T2		23AT11-	
		3	Silver	23AT2	23AT2-T	23AT2-T2		23AT2-	
			Gold	23AT12		23AT12-T2		23AT12-	
		4	Silver	23AT3	23AT3-T	23AT3-T2		23AT3-	
			Gold	23AT8					
Mom.	Maint.	2	Silver	23AT4	23AT4-T	23AT4-T2	23AT403-T2		
			Gold	23AT19					
		3	Silver	23AT5					
			Gold						
		4	Silver	23AT6		23AT6-T2			
			Gold						

① See locking chart on next page.

MIL-S-8805/26 Versions

Toggle Lever Position		No. of Poles	Type Contacts	Standard Lever "T2" Terminals		Tab Lever "T2" Terminals	
Keyway	Opposite Keyway			Catalog Listing	Military No.	Catalog Listing	Military No.
Maint.	Maint.	2	Silver	23AT73-T2	M8805/26-001	23AT473-T2	M8805/26-003
		4	Silver	23AT74-T2	M8805/26-002	23AT474-T2	M8805/26-004

Manual Switches

Toggle Switch Assemblies

13AT/23AT SERIES

3-POSITION ORDER GUIDES

Toggle Lever Position			No. of Poles	Type Contacts	Standard Lever			Tab Lever	Pull-To-Unlock Lever Solder Terminals (Add locking letter to cat. listings below)	
Keyway	Center	Opposite Keyway			Solder Terminals	"T" Terminals	"T2" Terminals	"T2" Terminals		
Maint.	Maint.	Maint.	2	Silver	13AT2	13AT2-T	13AT2-T2	13AT402-T2	13AT2-	Locking letters: All types
				Gold	13AT18	13AT18-T				
			3	Silver	13AT5				13AT5-	
			4	Silver	13AT9		13AT9-T2	13AT409-T2	13AT9-	
				Gold	13AT29					
Mom.	Maint.	Mom.	2	Silver	13AT1	13AT1-T	13AT1-T2	13AT401-T2	13AT1-	Locking Letters: E, L, or N
				Gold	13AT26			13AT423-T2		
			3	Silver	13AT4			13AT413-T2		
			4	Silver	13AT8		13AT8-T2		13AT8-	
				Gold						
Maint.	Maint.	Mom.	2	Silver	13AT3	13AT3-T	13AT3-T2	13AT403-T2	13AT3-	Locking letters: E, G, B, L, P or N
				Gold						
			4	Silver	13AT10			13AT410-T2	13AT10-	

MIL-S-8805/26 VERSIONS

Toggle Lever Position			No. of Poles	Type Contacts	Standard Lever "T2" Terminals		Tab Lever "T2" Terminals	
Keyway	Center	Opposite Keyway			Catalog Listing	Military No.	Catalog Listing	Military No.
Mom.	Maint.	Mom.	2	Silver	13AT271-T2	M8805/26-005	13AT471-T2	M8805/26-006
			3	Silver			13AT474-T2	M8805/26-012
Maint.	Maint.	Maint.	2	Silver	13AT272-T2	M8805/26-007	13AT472-T2	M8805/26-008
			3	Silver	13AT275-T2	M8805/26-013		
Maint.	Maint.	Mom.	2	Silver	13AT273-T2	M8805/26-009	13AT473-T2	M8805/26-010

LEVER-TO-BUSHING SEAL OPTION

A splash type lever-to-bushing seal can be provided to help prevent the entrance of moisture and dust behind the panel, or into the contact area. To specify 2-position switches with lever-to-bushing seals, change the 23AT catalog listing prefix to 32AT. Example: **32AT1** is a sealed 23AT1.

Convert 3-position catalog listings by changing the 13AT prefix to 31AT. Example: **31AT2-T** is a sealed 13AT2-T.

HERMETICALLY SEALED BASIC SWITCH OPTION

AT's with 15/32" bushings can be furnished with HM or HS hermetically sealed basic switches, which have metal-to-metal fusion around the cover, actuator base and mounting holes. Terminals are sealed glass-to-metal. The ¼" bushing 6AT design can also be provided with HM basic switches. For more information, contact the 800 number.

Shown with HM basic switches

LOCKING CONFIGURATIONS

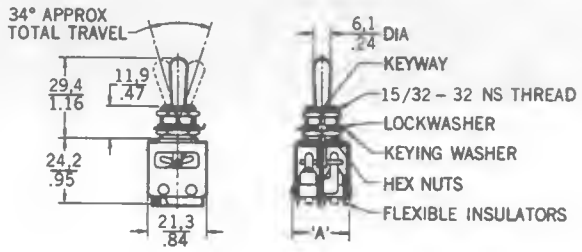
A	B	D	E	F	G	H
Locked In Three Positions	Locked In Center and Extreme Position (Keyway Side)	Locked Out Of Center Position	Locked In Center Position	Locked In Extreme Position (Opposite Keyway)	Locked In Extreme Position (Keyway Side)	Locked Out Of Center And Extreme Position (Keyway Side)

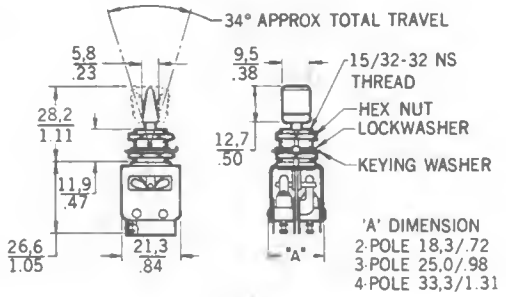
J	K	L	M	N	P
Locked Out Of Center And Extreme Position (Opposite Keyway)	Locked In Center And Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Keyway Side)	Locked Out Of And Into Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Opposite Keyway)	Locked Out Of And Into Extreme Position (Keyway Side)

Manual Switches
Toggle Switch Assemblies

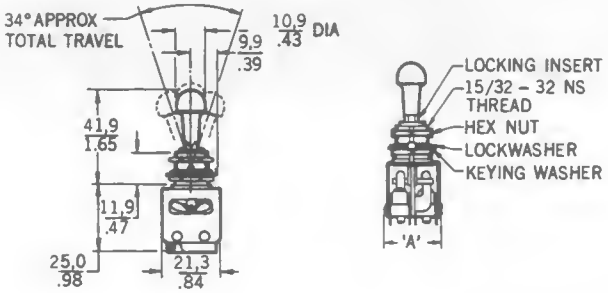
MOUNTING DIMENSIONS (For reference only)

13/23AT

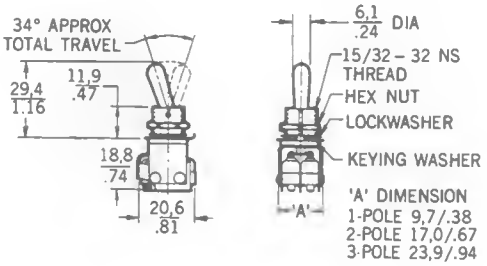


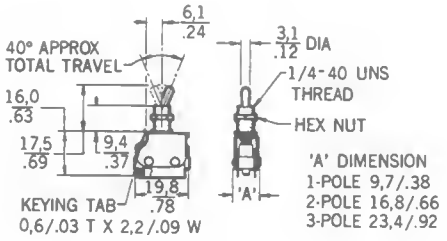


13AT401-T2



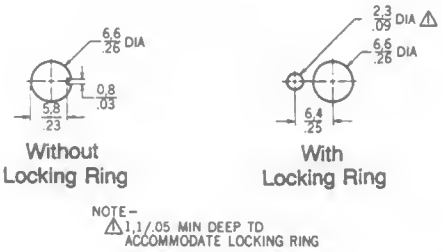
6AT



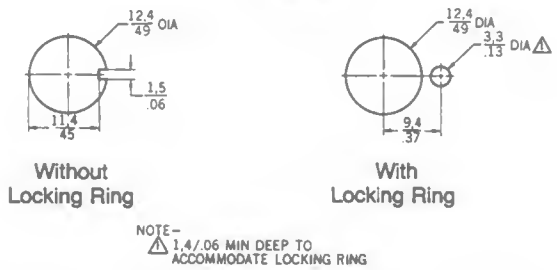


PANEL CUTOUTS

¼" Bushing



15/32" Bushing



Bushing mounting torque is 10–15 in./lbs.

NOTE—
64AT300, 66AT300, and 68AT300 (M8805/98) listings have a bushing seal and MS25196 panel seal.

Manual Switches
Accessories

TOGGLE LEVER SLEEVES ORDER GUIDE

Colored plastic lever sleeves are ordered by adding suffix letters which denote the desired color to the basic catalog listing.

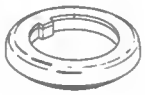
Toggle Switch Type	Basic Catalog Listing	Color Suffix					
		Blue	Black	White	Green	Yellow	Red
AT, TL, NT, TS with 15/32" bushing and standard lever	15PA90-4	BL	BK	W	G	Y	R

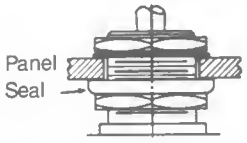
Example: 15PA90-1R
Red sleeve fits 15/32 in. bushing NT.

DECORATIVE MOUNTING NUT ORDER GUIDE

Style	Description	Bushing Size	Catalog Listing
A	Knurled Nut (Bright Nickel)	1/4"	19PA5-1
		15/32"	19PA6-1
	(Black Finish)	15/32"	19PA6-4
C	Hex Nut (Black Finish)	1/4"	19PA5-3
		15/32"	19PA6-3
D	Tapered Nut (Chrome Finish)	15/32"	19PA6-5

PANEL SEAL





For use with 15/32 in. bushing toggle switches, this corrosion resistant steel cupwasher has a silicone elastomer lining and keying tab for sealing the bushing keying slot. Use in panels up to .125 in./31,8 mm thick.

Catalog Listing	Military No.
15PA87	—
15PA195-TL	M5423/16-01

LEVER/PANEL SEAL

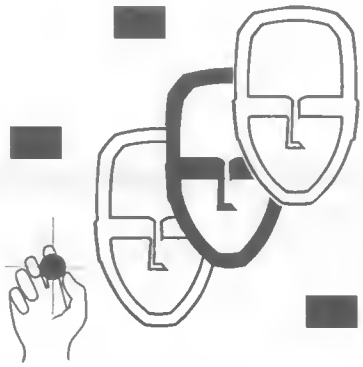
For use with standard lever toggle switches with 15/32 in. bushings. Consists of a silicone elastomer seal boot and panel seal bonded to a hexnut.

Catalog Listing
10PA4

For: TOGGLE FULL BOOT SEAL
Contact: APM Hexseal
Englewood, NJ
(201) 569-5700

Toggle/Rockers

Applying Manual Controls and Displays



Adherence to good human factors principles can help your product make good first impressions as it is being evaluated by your customers; and increase long-term user satisfaction. You can gain a competitive edge that may translate into better acceptance by your customer and the user.

The panel, being the surface provided for display and control components, serves as the direct interface for human/machine dialogue. We'd like to offer the following guidelines to help you achieve ergonomically pleasing panels where communication flows operator-to-machine, and back again.

PREPARATION

Begin with procedures common to any design process. Prepare a list of the requirements related to the job to be performed. Then ask yourself such questions as:

- What is the panel (control station) to do?
- Who will be the users?
- Is there a special sequence of procedures to follow?
- Are there special environmental conditions or military requirements?
- Will the equipment be used inside or outside; in a shop, home or office?
- Will barriers, guards or protective shields be needed to safeguard components and/or users?
- Will the maintenance tasks be performed by the equipment user or a technician? How often and how easy to do?
- Who will install or set up the equipment?
- Are elaborate instructions required or can you design to make them unnecessary?
- What components are available?
- Will you do the specifying?
- What are the cost constraints?
- What elements should be added to estimate total installed cost?

Explore as many alternate means of achieving the desired results as possible. Then select the most effective combination of components. The earlier the foregoing questions are asked and answered in the concept or selection process, the more closely the panel design will match the requirements of a given application.

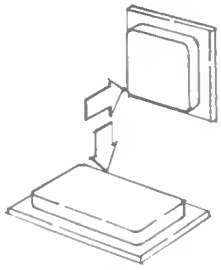
MATCH CONTROL TO FUNCTION

People expect controls to move in certain ways. Where possible, component selection should be an extension of normal habit patterns. For example, the wall-mounted toggle switch found in homes conveys a habit pattern for turning on lights. The upward flipping motion generally associated with "ON" can be used with other toggle, rocker and paddle switches for a natural transfer of a previously learned habit.

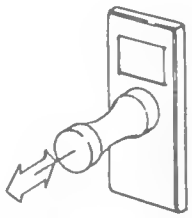
The clockwise motion of a rotary knob is frequently used to select an appliance function, such as the desired washer cycle. This same familiar action may be adapted to a control panel as an extension of a normal habit pattern.

When a panel uses control actions well-established in our daily lives:

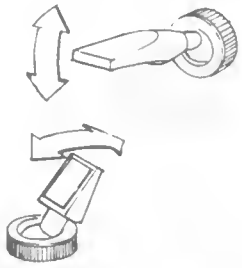
- Reaction time is reduced.
- The first control movement by an operator is usually correct.
- An operator can perform faster, and can make adjustments with greater precision.
- An operator can learn control procedures faster.



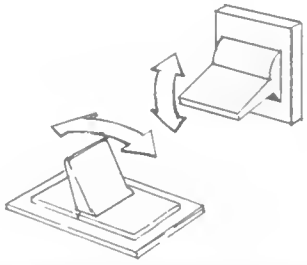
Pushbuttons (alternate-action or momentary)



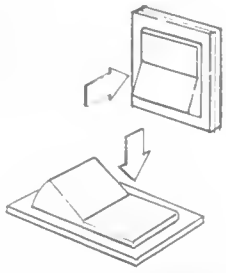
Push/pull switches



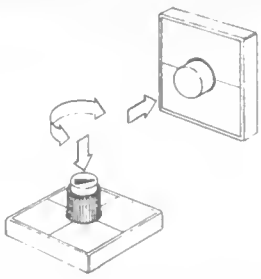
Toggles for 2- or 3-position select



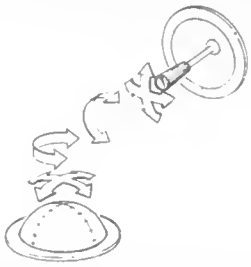
Paddles for 2- or 3-position select



Rockers for 2- or 3-position select



Pushbutton and rotary pushbutton/selector



Trackball and joystick controls for 3-D maneuvering of CRT cursors in mapping or tracking tasks

Applying Manual Controls and Displays

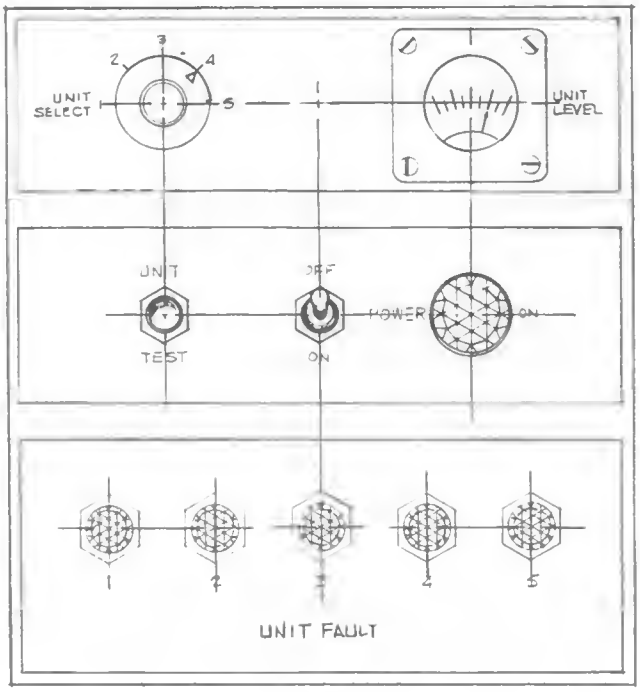
COMPONENT ARRANGEMENT

Some control panels become overly complex because of the number and different types of components, or because the designer failed to explore enough alternative arrangements.

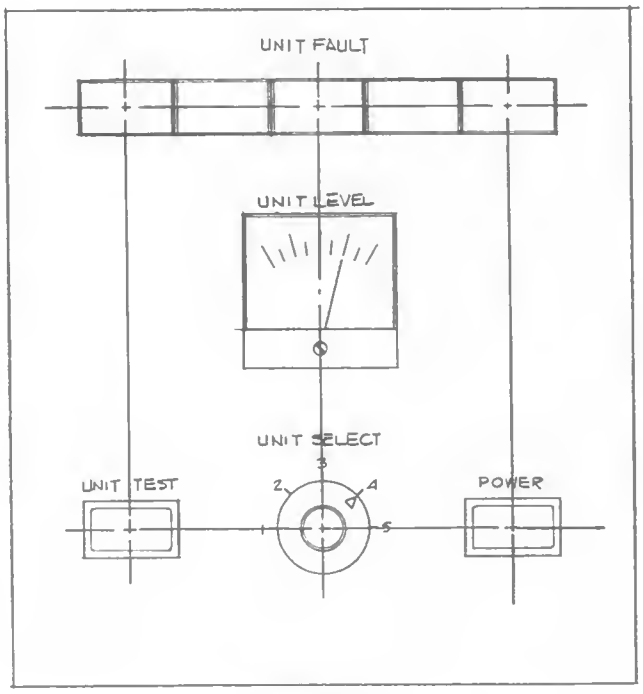
Before drawing the elements on a panel outline, it is helpful to make paper cutouts of the separate switches, indicators, etc. These cutouts can be easily shifted into various groups, and relationships until the most effective arrangement is found. You will save hours of tedious drawing, erasing and redrawing, and should achieve a better layout. Also, you are more likely to resist the temptation to stop looking for the optimal solution too early in the design process.

Here are some suggestions for good arrangement:

1. Frequently used components should be the most accessible.
   - for manually operated controls, somewhere between elbow and shoulder height.
   - for displays, nearest the normal line of sight.
2. Arrange controls and displays for a conventional sequence of operation, left-to-right and top-to-bottom, just as we normally read.
3. Define functional areas by leaving space between component groups. Avoid outline borders, color patches and brackets extending from group titles (except in cases of extreme density.)
4. Locate emergency controls and displays prominently on the panel to assure easy viewing and access by the operator.
5. Where large layouts are necessary, distribute the workload between both hands of the operator — for ease of operation and increased productivity.
6. Locate displays above (preferable) or to the left of corresponding manual controls to prevent visual interference while the manual controls are being operated. (When manual controls are at the extreme left of a panel, displays should be above the controls.)



Poor



Preferred

Alternative panel layouts. These before-and-after views illustrate how an existing design may be upgraded to better communicate through layout revision and component substitution. Both function and appearance are improved.

For example, the left hand panel uses outline frames to unnecessarily separate related functions. The frames serve merely as a decorative feature and contribute to a crowded look. In the right hand panel, the frames are eliminated, as the components themselves define their functional space.

The uniform use of square and rectangular panel elements in the right hand panel serves to futher simplify and harmonize the appearance. Note that the UNIT FAULT indicators and the analog meter are located in the top half of the panel to help prevent the operator's hand from obscuring them when the controls are being used. The POWER switch-indicator combination eliminates the separate POWER ON light. Also, legends appear above their respective components, rather than in the left hand version's random arrangement.

Applying Manual Controls and Displays

GRAPHICS CONSIDERATIONS

Panel graphics need not overwhelm the operator with their size, since they are normally viewed at about arm's length.

Legibility is reinforced when the color chosen for the graphics contrasts strongly with the background. Type is most legible when it is shown as dark lettering on a light panel.

Panel Titles

Titles applied to the panel itself should normally appear above the controls to prevent them from being obscured when a control is in use. An exception would be when panel components must be placed at a height that would block the operator's line of sight to the title.

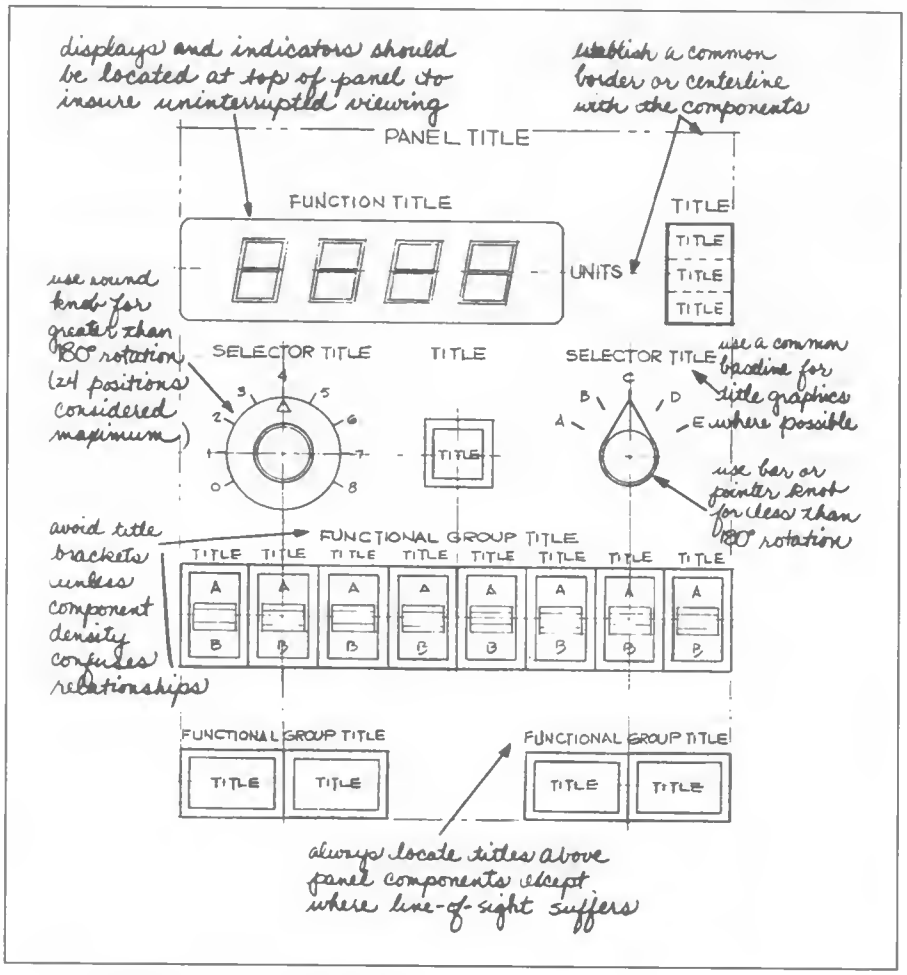
If different-sized components are used in a horizontal array, pick a common baseline for all their associated titles to avoid a stepped, disorderly look.

Whenever possible, apply graphics directly on the manual controls or lighted indicators themselves. This not only conserves valuable panel space, but enhances overall design flexibility. Recommended graphic colors for component surfaces are white on red, green, and blue; black on yellow and white; and white or black on amber.

Alphanumeric and symbol legends can be added or easily changed merely by replacing a switch or indicator button, lens, or rocker-button operator.

Type Selection. All titles should be composed of a simple sans serif typeface for optimum clarity (see examples, at right). Lettering should be horizontal, never vertical. Type sizes should conform to panel component priorities (refer to typical letter heights for titles in descending order, as shown on page 184).

Avoid abbreviations whenever possible; spell out the entire word. If horizontal space is tight, try condensed type, but use it consistently, not interspersed with a standard width type. Inconsistent use of the type styles, sizes, or line weights add visual "noise" to the overall panel scheme and should be avoided.



Layout and graphic design considerations

Typeface Examples

Helvetica Medium (This is the preferred type proportion and weight for most titles).

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1 2 3 4 5 6 7 8 9 0

Helvetica Medium Condensed

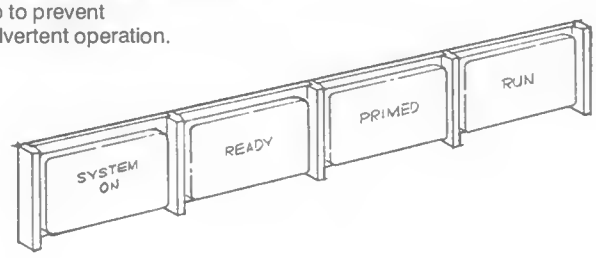
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1 2 3 4 5 6 7 8 9 0

Helvetica Bold

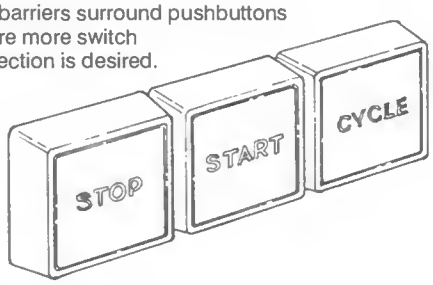
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1 2 3 4 5 6 7 8 9 0

Applying Manual Controls and Displays

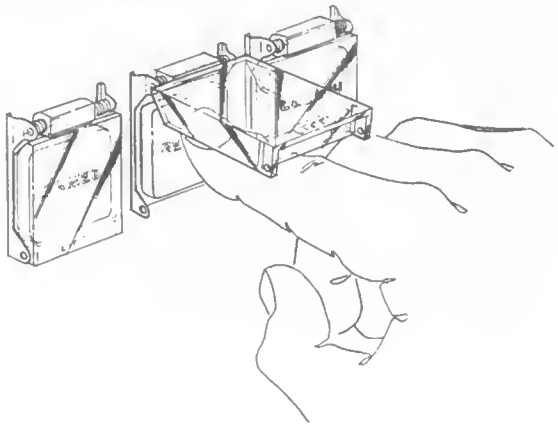
Strip barriers between switches help to prevent inadvertent operation.



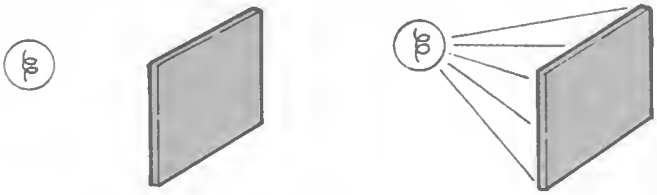
Full barriers surround pushbuttons where more switch protection is desired.



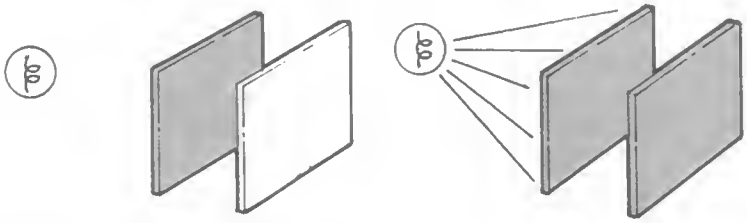
Hinged guards over pushbuttons in high risk control situations. Guards may also be locked for additional security.



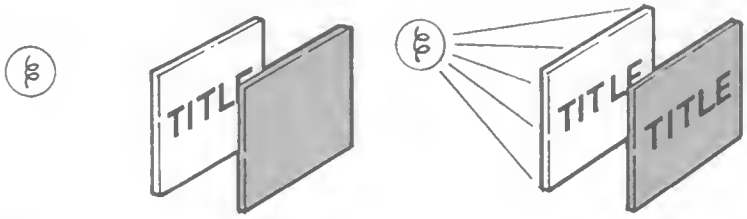
ILLUMINATED COLOR TECHNIQUES



Transmitted color achieved with colored lens (color is visible even when display is unlighted).



Projected color achieved with colored filter behind white lens (color not visible until lamp is lighted).



Hidden legend/hidden color (dead front). Dark lens hides color/message until display is lighted.

Transmitted color refers to the use of colored buttons in applications when the color must be apparent when the display is lighted or unlighted.

Projected color is achieved with a white lens and a color filter/lens. When the lamps are off, the display is white. It becomes colored when illuminated. Though effective in dimly lit or dark rooms, the color signal tends to weaken in high ambient light.

Dead front is a hidden legend/color display which generally uses a transparent, smoky gray lens with a legend on a color insert. The display appears black and unabtrusive when the lamps are off. When illuminated, color and legend appear.

Ready-to-install low-profile pushbutton matrices can serve as panel elements or an entire panel. Intelligence can be provided by on-board microprocessors which terminate to a plug-in connector.

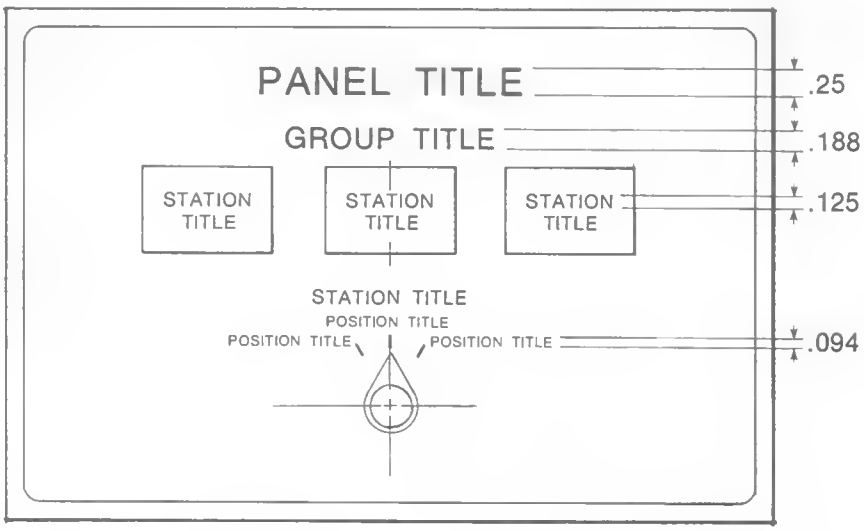
Applying Manual Controls and Displays

TYPE SIZES

The type sizes chosen should always correspond to the functional priorities of the control panel components, in a descending order, e.g., Panel Title, Group Title, Station Title. Individual application requirements may vary, but grossly oversized letters should be avoided (see drawing).

COLOR CODING

Follow accepted human factor standards when you color code interface components. Since many colors relate to certain well established meanings, e.g., red for STOP, green for GO, they should be used wherever appropriate.



Color	Meanings	Examples
Red	Alerts an operator that an incompatible or dangerous condition exists and corrective action should be taken.	Stop, No-go, Error, Failure, Malfunction, Danger, Warning, Hazard, Take Cover
Yellow	Marginal condition exists	Pressure Below Normal, Check Hopper Level, Caution, Inspection Port Open
Green	Monitored equipment is in tolerance, or a condition is satisfactory and it is all right to proceed	On, Power On,* Go-ahead, Safe, Ready
Blue	May use as an advisory indicator, but has limited coding value; however blue is ideally suited for use at periphery of vision where it can be apparent, but not intrusive	High Beam (automobile headlights)
White	Indicates system conditons or transitions, neither positive nor negative; doesn't imply success or failure	Boiler #1 On Line, Reservoir Cycling

* Note: The power generating industry is an exception, since it traditionally has used the color red to indicate Power On. Their rationale is that red connotes a "hot" electrical condition. However, green is definitely the preferred human factors choice for Power On indication.

PANEL FINISH

Non-reflecting, matte-textured colors from light gray to black, beige, and white will yield a panel that contrasts well with controls and indicators of any color. Neutral color backgrounds will focus attention on the controls. But color effectiveness is muted when interface components are surrounded by a panel of a like or similar color.

When in doubt, keep it simple and in good taste – and you will achieve the most satisfying, long-term results.

FINAL EVALUATION

Prior to finalizing your design, evaluate the total panel layout experimentally. Assess its communication effectiveness with a test situation, using a mock-up or prototype. Describe the application to typical operators, individually.

Observe the procedures used by the operators. If there are basic design errors, they should show up, along with the operator's preferences for certain control features. Separate individual prejudices from valid criticisms. Then apply the data to a revised layout. Check and recheck.

In actual practice, there are normally several revisions made beyond an initial proposal. Rarely, if ever, does the first scheme prove acceptable as the final design; so don't be disheartened when new insights from associates or test results necessitate change. Even after a design goes into production, it is not unusual for revisions to be made because of undiscovered problems.

Other MICRO SWITCH Solutions

SOLID STATE SENSORS

HALL EFFECT SENSORS

Hall effect sensors respond to a magnetic field, or—in the case of Hall vane sensors—to the interruption of a magnetic field. They operate at extremely high speed – 100 KHz – and include signal conditioning. They offer high reliability, long life, and compatibility with microprocessors and other electronic circuitry. They are available in a wide variety of packages ranging from PCB mount to custom packaged housings with actuators, cables and connectors.

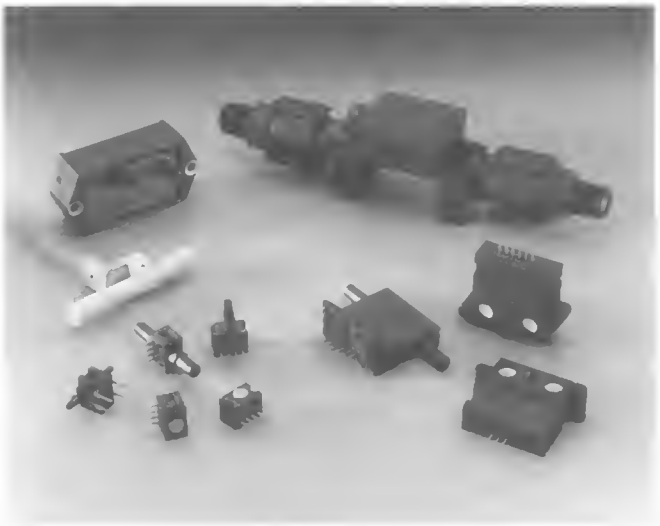
Applications include: brushless DC motors sensors, anti-skid braking sensor, piston detection in hydraulic cylinder, valve position sensing, cam, lever, shaft position sensing, tachometer, counter pickup, speed sensor – rate, under, over speed.

CURRENT SENSORS

CS series solid state current sensors monitor either alternating (AC) or direct (DC) current. This series includes a wide assortment of devices ranging from digital output current detectors capable of sensing a few hundred milliamps to linear sensors capable of monitoring several thousand amps. The entire family of CS current sensors provides a means of accurate low-cost current sensing.

Applications include: in-line test equipment, automotive diagnostics (battery drain detector), ground fault detectors, motor overload protection, current motoring of electric welders, energy management systems, protection of power semiconductors.

Request Catalog 20.



PRESSURE SENSORS

Pressure sensors use piezoresistive technology meaning that input pressure causes a silicon chip to deflect. The change in shape creates an electrical output proportional to input pressure. They are precise with pressure ranges from .2 PSI – 250 PSI. They are highly repeatable and packaged to meet virtually any application requirement.

Applications include: medical instruments, home appliances, engine controls, environmental control systems, water management, wind speed, altimeters, and pneumatic controls.

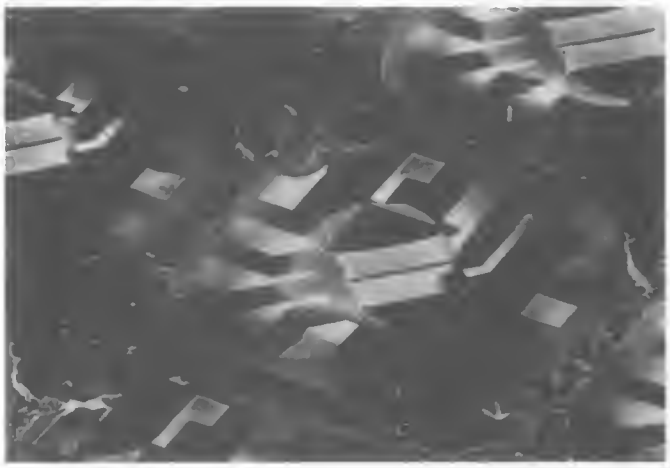
Request Catalog 15.

AIRFLOW

The Microbridge mass airflow sensor detects airflow by measuring heat transfer of air moving across the surface of a sensing element. State-of-the-art chip design and manufacturing techniques allow the microbridge to be remarkably sensitive, fast, small.

Typical applications include: HVAC damper control, analyzers, medical equipment, process control.

Request Catalog 15.



Other MICRO SWITCH Solutions

INFRARED PRODUCTS
Optoelectronics is the integration of optical principles and semiconductor electronics. Optoelectronic components are reliable, cost effective sensors. Infrared emitter or detector are used for sensing presence/absence, position, velocity and direction. Sold in a variety of packages including: plastic and hermetic components, assemblies and custom assembles.

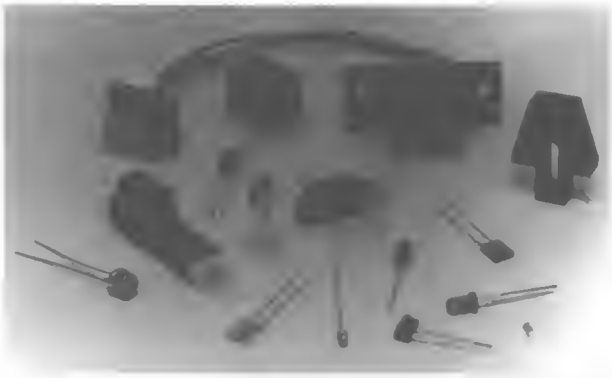
Typical applications include: paper sensing in copiers and printers, medical equipment, computer equipment, touch screen.

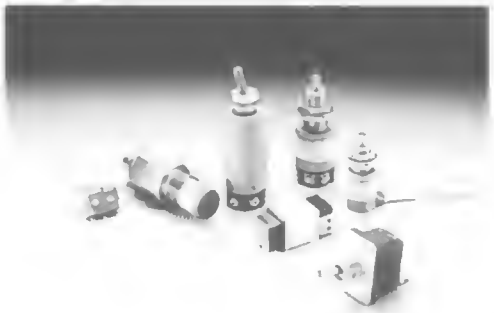
Request Catalog E26.

FIBER OPTIC LAN PRODUCTS
Incorporates IR Opto technology into active components and modules for data communication. Used in place of wire, fiber optics offers advantages including: high speed, EMI/RFI immunity, security, light weight and small size.

Active fiber optic products are compatible with the majority of standard multimode fiber optic connectors and cables now available in industry.

Request Catalog 27.





ENVIRONMENTALLY PROTECTED SWITCHES
Many additional sealed basics are available than shown in this catalog. They can be environment-proof or the ultimate – HS and HM hermetically sealed switches.

Sealed switch assemblies (EN, HE, HR) are commonly used as limit switches in aircraft applications. Again, they can be environment proof or hermetically sealed. HR's will operate at 600°F.

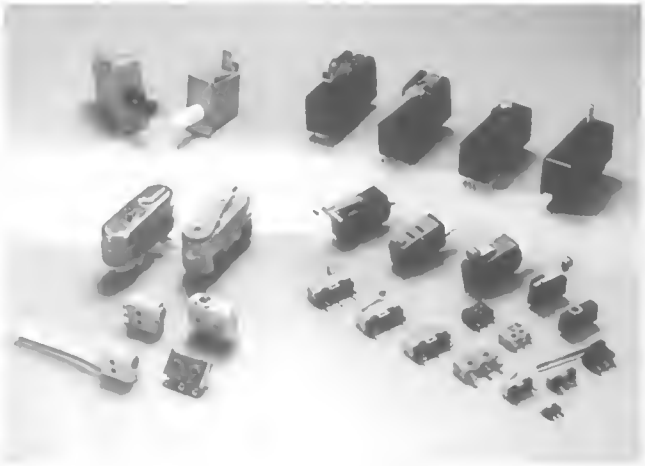
Environmentally protected switches also satisfy needs in many other applications. Some examples are agricultural, transportation, construction, marine, 45ordnance, and command and control equipment.

Request Catalog 80.

BASIC SWITCHES
MICRO SWITCH has many other standard size switches than shown in this catalog and many other variations of the switches shown.
- MT high DC capacity
- HT 1000°F temperature operation
- 6AS tandem mount
- TB twin break/special circuitry
- AS mercury tilt-to-operate switches

The largest variety of small basic switches range from:
- V3/V7 miniature types
- SM/UM/SX/UX subminiature types
- US ultra miniature

Request Catalog 10.



Other MICRO SWITCH Solutions

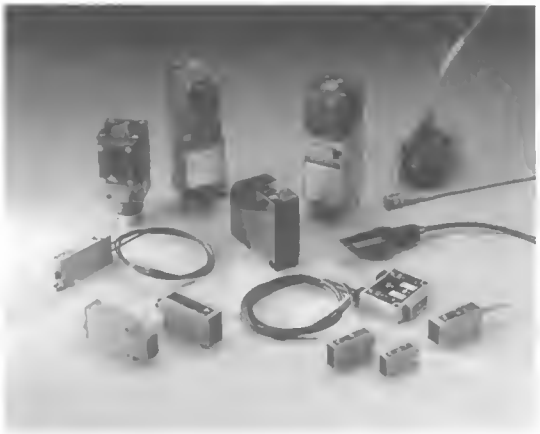
LIMIT AND ENCLOSED SWITCHES
Limit and enclosed switches are the cost-effective switches of choice for detecting objects which can be touched. Rugged and dependable, these switches are offered in a variety of sizes, with differenct seals, enclosures, actuation, circuitries, and electrical ratings.

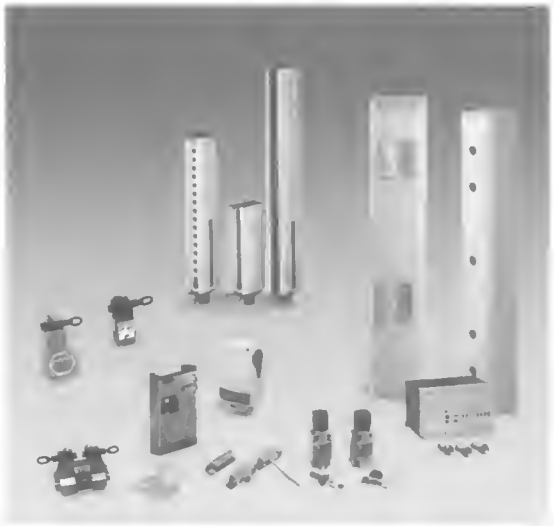
The GLS series is specifically designed for world-wide applications and is supported by Honeywell global resources for sales and after sales service.

Request Industrial Catalog.

PHOTOELECTRIC SENSORS/CONTROLS
MICRO SWITCH photoelectric sensors are as diverse – in size, design, extras, and intended use – as the dissimilar needs of production, plant, and design engineers throughout industry. The proving grounds range from brewery to sawmill, and the applications from material handling to process control. They can be used to detect – at distances of a fraction of an inch to several hundred feet – all opaque and even translucent materials. The variety of available scanning options and the addition of fiber optics extends application freedom. You can be confident of the superior quality of all MICRO SWITCH photoelectric controls – the result of more than a quarter of a century of design, manufacturing, and application experience.

Request Industrial Catalog.





SAFETY PRODUCTS
Honeywell offers a variety of state-of-the-art safety products to meet a wide range of applications. Technologies include:
- Photoelectric light curtains and guards for point-of-operation and perimeter protection
- Electromechanical switches with positive break for hinged and sliding guard doors, protective covers and assembly lines
- Hall Effect proximity sensors for door interrupt applications

Honeywell safety products strictly comply with global safety and reliability requirements — helping customers compete on a world-wide basis.

Request Industrial Catalog.

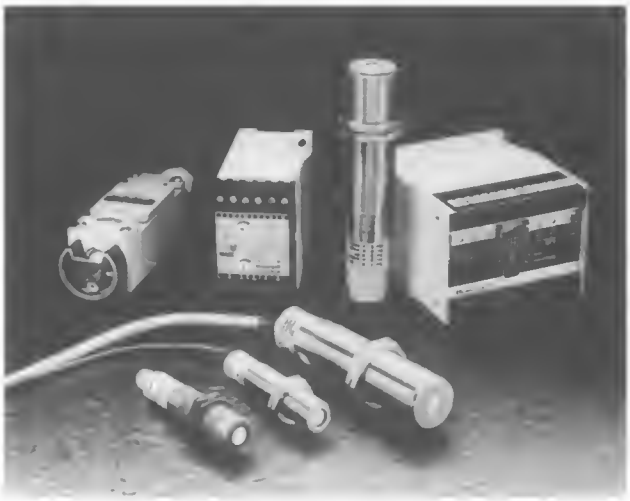
Other MICRO SWITCH Solutions

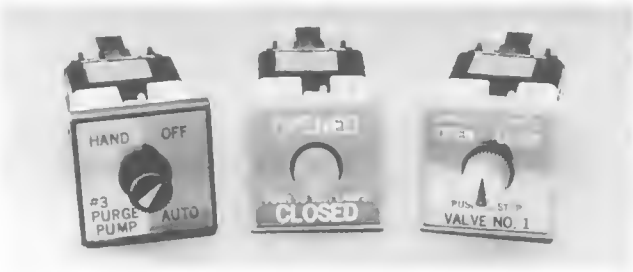
PROXIMITY SENSORS
Proximity sensors detect the presence of metals or react to a magnetic field. Cylindrical, cannister, and limit switch style housings provide application versatility. Their high speed operation keeps pace with production. Models are available for operation at AC line voltage or wide range VDC. Optional LED indicators signal on-off condition.

Request Industrial Catalog.

ULTRASONIC PRECISION PROXIMITY SENSORS
Ultrasonic position sensors solve tough sensing problems, detecting targets made of practically any material. They work in dry, dusty environments.

Request Industrial Catalog.

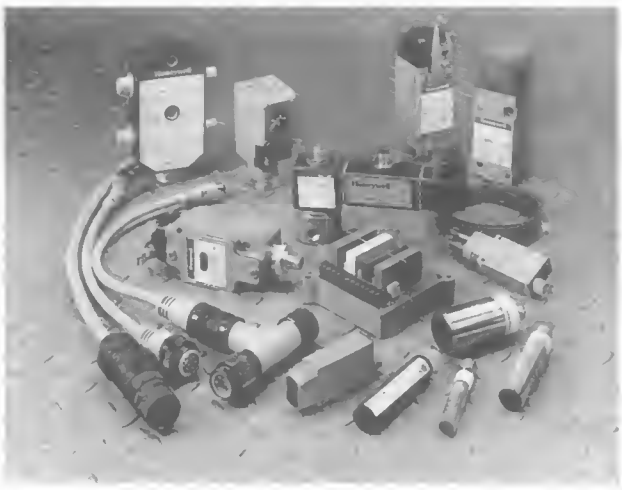




MULTI-LIGHT OILTIGHT CONTROLS
Featuring the contemporary square appearance and lighted display, the CMC family offers a wide selection of industrial pushbuttons, selectors and indicators. Contact blocks include heavy duty, standard or electronic duty, plus the four plunger adapter kit to use all four points on the cam.

Request Multi-light Oiltight Controls Catalog.

Other MICRO SWITCH Solutions



SMART DISTRIBUTED SYSTEM
The Smart Distributed System is a bus system for intelligent sensors and actuators that streamlines the system installation process and empowers your inputs and outputs to operate at levels you never thought possible. Over a single 4-wire cable, Smart Distributed System can interface up to 64 physical modes and up to 126 addresses. These intelligent sensor and actuator devices do much, much more than just turn on and off.

SYSTEM DIAGNOSTICS
The Smart Distributed System has system-level diagnostics such as reporting when a device stops communicating with the host.

DEVICE DIAGNOSTICS
Many of the Smart Distributed System devices have special diagnostics designed into them. For instance, some of the photoelectric controls can send warning messages if their lenses get dirty or they are out of alignment. Other diagnostics are also available.

DEVICE FUNCTIONS
All Smart Distributed System devices are intelligent and can be setup, via the Activator or PC base control programs, to perform high-level functions that non-System devices simply cannot do. Using the System device functions you can off-load rudimentary control functions to the devices, allowing the host to concentrate on other tasks. Smart Distributed System device functions include:

- Normally-open or normally-closed (switches and sensors)
- Light operate or dark operate (photoelectric controls)
- On-delay
- Off-delay
- Motion or jam detection
- Batch counter
- Number of operations count
- Number of power cycles count.

TRULY OPEN DISTRIBUTED MACHINE CONTROL
The Smart Distributed System is uniquely and completely open. It works with the PLC or PC control device of your choice. That makes the Smart Distributed System completely compatible with your present control system or whatever control system you have in mind for the future. In fact, no other distributed machine control system offers as much flexibility or growth potential. The Smart Distributed System protocol will even accommodate peer-to-peer communication.

MORE DEVICE SELECTION FOR GREATER FLEXIBILITY
Many manufacturers of industrial control devices have become part of Smart Distributed System simply by integrating our CAN-based chips or by utilizing off-the-shelf interface devices. The Smart Distributed System can be easily integrated into your control system, allowing you to choose the equipment and manufacturers that best match your application.

For more information on the Smart Distributed System contact us at the phone numbers below.

Other MICRO SWITCH Solutions

SMART DISTRIBUTED SYSTEM
INTEGRATED SMART CONTROL[PC] MADE EASY

The Smart Distributed System — developed by Honeywell's MICRO SWITCH Division — is an advanced system, open at both the control and device levels, for optimizing machine applications. Now, with the addition of Honeywell Smart Control[PC], it takes another leap forward in enhancing the efficiency, reliability and productivity of many manufacturing and distribution operations. This truly integrated control solution comprises a powerful CAN-based device-level network, intelligent I/O devices, PC hardware and software — all backed by comprehensive service and support from a global industrial control manufacturer.

EASY TO INSTALL

Honeywell Smart Control[PC] puts control technology at your fingertips, making system setup quick and convenient.

- **Faster programming** — Flow-chart program designing is easy to learn, easy to use, and already familiar to many programmers. It allows users to develop additional functions that are not possible with conventional programming languages.
- **Write it your way** — Flow charts allow you to personalize the control program. For example: descriptive names, instead of cryptic codes, can be assigned to I/O points.

EASY TO USE

Now automated operations are more user-friendly, more *accessible.* Honeywell Smart Control[PC] makes interaction almost effortless with intuitive screens, full-color graphics and point-and-click simplicity.

- **Data manipulation** — Information can be easily displayed, analyzed, stored and retrieved.
- **Diagnostics** — Colorful screens communicate the status of the Smart Distributed System, reporting potential problems before they cause costly shutdowns.
- **Real-time access** — The high-speed control made possible with the Honeywell Smart Control[PC] solution means no more PLC bottlenecks.
- **Practical prompts** — Comprehensive error-checking and "help" functions guide the user, which simplifies monitoring and speeds troubleshooting.

EASY TO ADAPT

The Smart Distributed System is completely open and modular, completely compatible with an unlimited variety of I/O devices, communications networks and off-the-shelf computer hardware and software components.

EASY TO CHANGE

The plug-and-play nature of the Smart Distributed System lets you add, remove or relocate devices without rewiring. Honeywell[PC] Control is equally versatile, allowing fast, efficient reconfiguration to meet specific application needs.

EASY TO UPGRADE

Unlike proprietary PLC-based systems, which can hold you back, the Smart Distributed System helps you lower life-cycle costs. It allows you to preserve your investment by adding I/O points without additional wiring, leveraging price/performance benefits of PC technology advances, and migrating toward peer-to-peer communication among devices.

EASY TO CHOOSE

The Smart Distributed System with Honeywell Smart Control[PC] delivers high performance without the high costs of proprietary control architectures.

- Simplified installation reduces your initial investment.
- A user-friendly interface decreases operator training costs.
- Maintenance and troubleshooting features minimize downtime.
- The open device-level network protocol ensures adaptability with a wide variety of devices.

For more information on the Smart Distributed System contact us at the phone numbers below.

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